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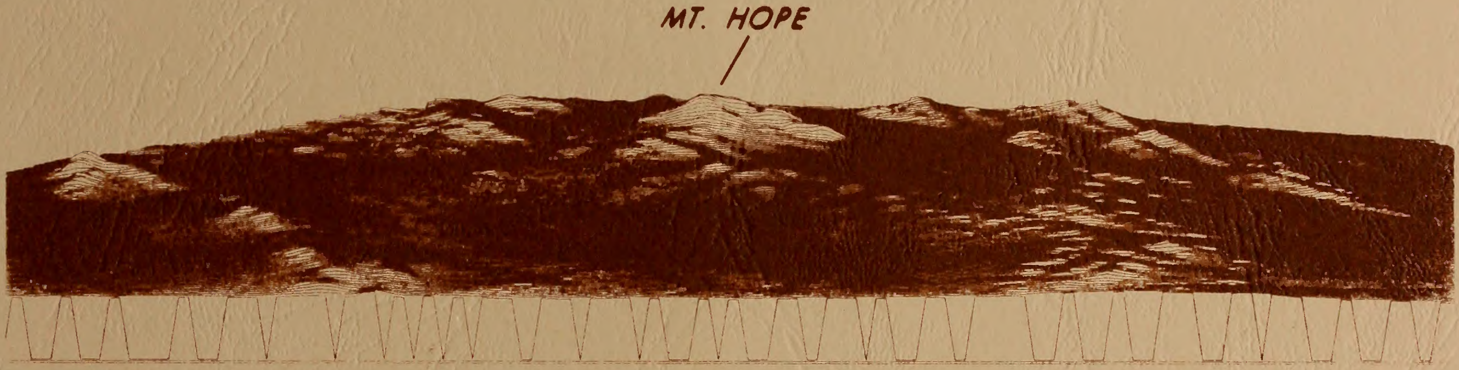
TECHNICAL REPORT NO.3

MT. HOPE MOLYBDENUM PROJECT



View from the south looking north

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN, NEVADA

DECEMBER 1984

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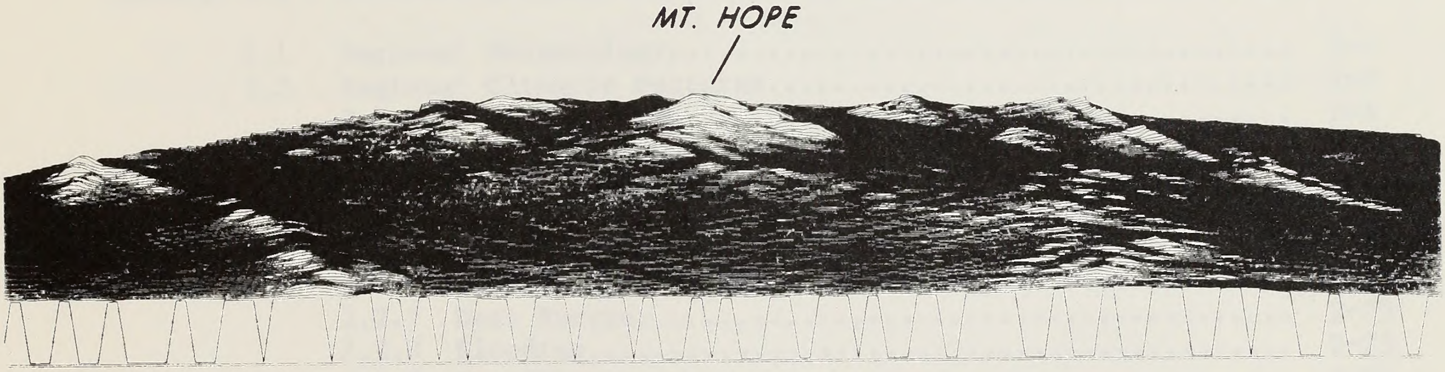
METEOROLOGY AND AIR QUALITY

TECHNICAL REPORT NO.3

MT. HOPE MOLYBDENUM PROJECT



View from the south looking north

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BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN, NEVADA

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RENO, NEVADA

METEOROLOGY AND AIR QUALITY

TECHNICAL REPORT NO.3

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CHAPTER 1.0
INTRODUCTION

1.1 Introduction

This technical report presents detailed information concerning the atmospheric resource base and any significant potential impacts to the air quality of that resource base upon implementation of the proposed action and/or alternatives.

1.2 Project Description

Technical Report No.1 and Chapter 2.0 of the Mt. Hope Molybdenum Project EIS detail the proposed action and alternatives. In brief, the Mt. Hope Molybdenum Project Environmental Impact Statement (EIS) (including Technical Report Nos.1 thru 9) have been prepared in response to an EXXON Minerals Company (EXXON) proposal submitted to the Bureau of Land Management (BLM) for the purchase of public lands under Section 203 of the Federal Land Policy and Management Act (FLPMA) of 1976. Although the land purchase proposal is the action which occasions the Environmental Impact Statement (EIS) process, there are other federal decisions which must be made before EXXON may proceed. Among these are the granting of power, water line and highway relocation rights-of-way and the approval of a Plan of Operation.

The primary purpose of the proposed sale of public lands involves the planned activities of EXXON which has for some time been conducting preliminary feasibility studies assessing the development of a molybdenum deposit in the vicinity of Mt. Hope near Eureka, Nevada. As part of the EIS process, EXXON has detailed its preliminary plans concerning project development. The Mt. Hope project includes the development of an open-pit mine, non-mineralized material storage areas (2), a process plant complex of approximately 100 acres and a tailings material disposal site. As support features to the project, a proposed water line and power line would also be necessary. The proposed tailings pond site would, if implemented, require an approximate six mile relocation of an existing state highway (State Route 278).

Figures 1-1 through 1-8 show project area location and depict the proposed action and alternatives (except the location of a subdivision plat). Table 1-1 outlines the components of the proposed action and alternatives, including the no action alternative.

1.3 Baseline Data Development

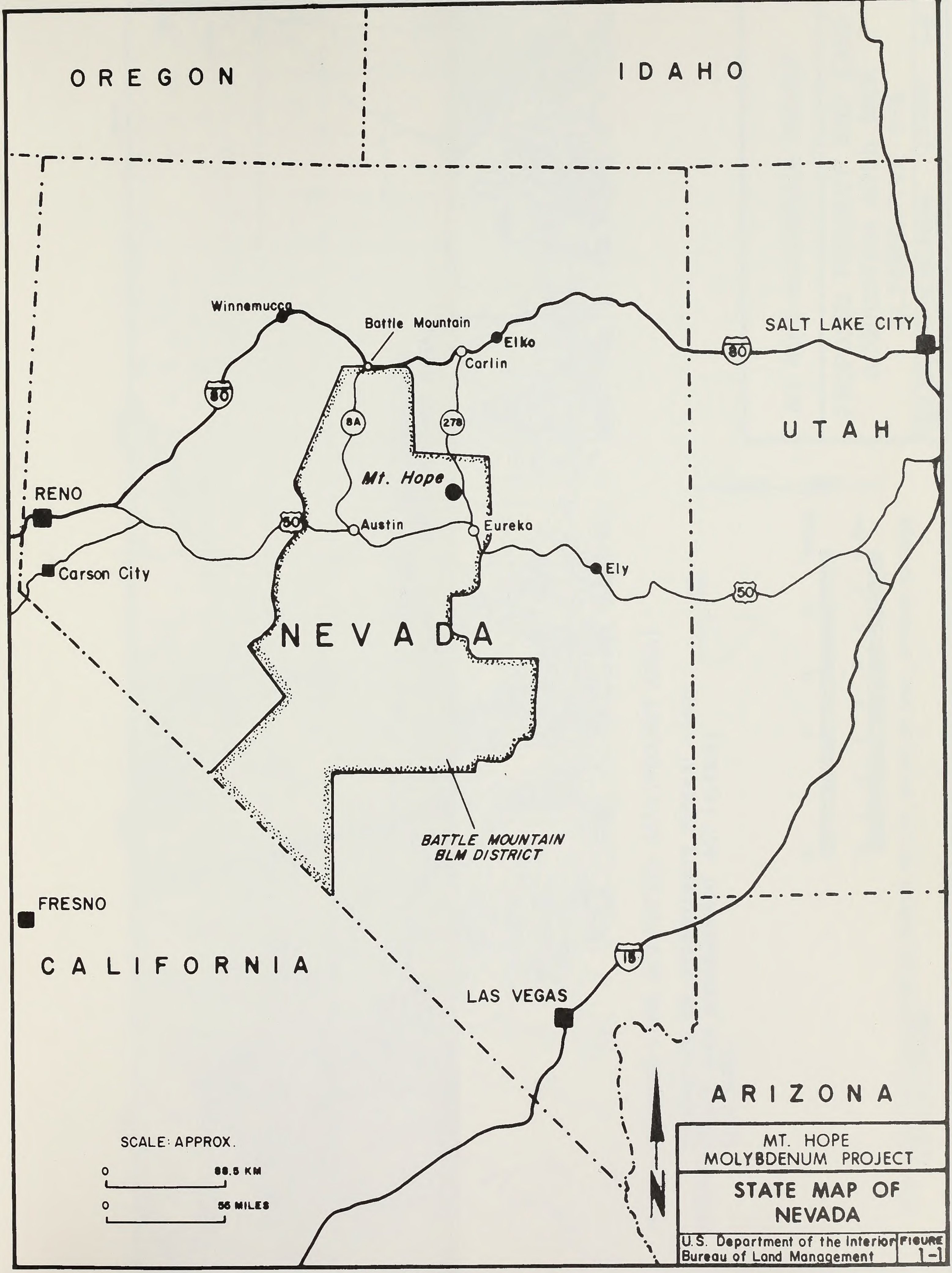
Early in the EIS process, the BLM and EXXON agreed in a Memorandum of Understanding (MOU) that the EIS process of data collection, analysis and documentation would be assisted by the involvement of an independent third party consultant, Wyatt Research and Consulting, Inc. (WRC). WRC initiated its involvement as an oversight quality assurance consultant in the development of a project source document for subsequent use in developing the Mt. Hope Molybdenum Project EIS. Entitled the Mt. Hope Molybdenum Project Environmental Impact Report (EIR), the source document included two chapters of information concerning environmental resources (baseline data and impact analyses) and prepared by WRC with assistance from the BLM and available study results of EXXON (e.g., cultural resources consultant report, geology, etc.). During the preparation of the source document and continuing throughout the EIS process, WRC has collected, reviewed and analyzed pertinent data in each of the necessary topical areas of environmental resources.

This technical report documents the majority of information gathered and analyzed that was pertinent to meteorologic and air quality resources. The primary sources of meteorologic and air quality resource information are included in the following:

1) Conger, T. A. (Sharp, Krater, Engstrom and Associates, Inc.) 1974. Eureka County General Plan.

2) Eakin, T. E. 1961. Ground-Water Appraisal of Pine Valley, Eureka and Elko Counties, Nevada, Ground-Water Resources Reconnaissance Series Report 2, Nevada Department of Conservation and Natural Resources.

3) Henningson, Durham and Richardson Sciences, Inc., (HDR). 1980. M-X - Environmental Technical Report (ETR) No. 13 Atmospheric Resources. December 22. Santa Barbara, California.

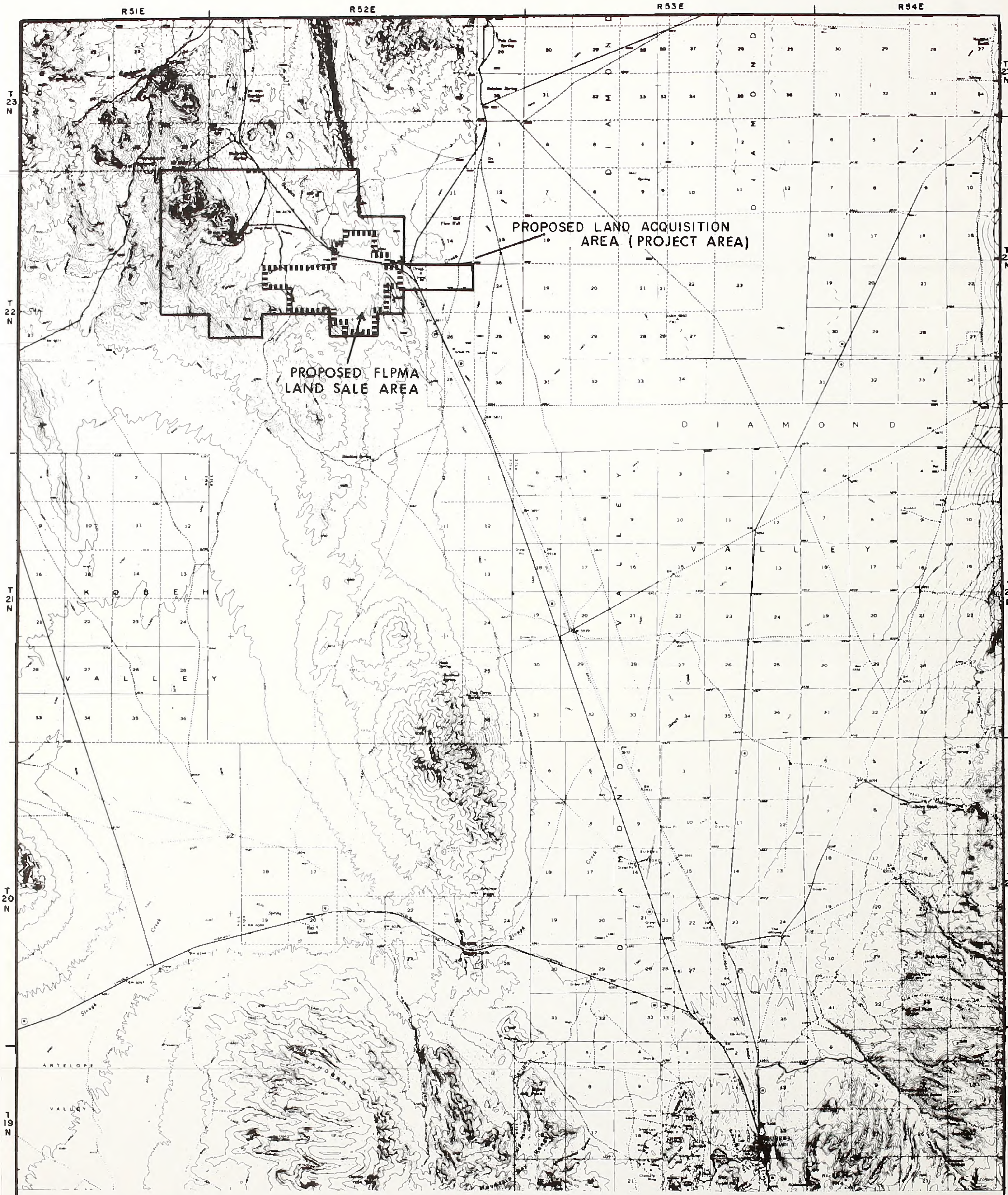

OREGON
IDAHO
Winnemucca
Battle Mountain
Elko
Carlin
SALT LAKE CITY
80
8A
278
UTAH
Mt. Hope
RENO
50
Austin
Eureka
Carson City
Ely
NEVADA
BATTLE MOUNTAIN BLM DISTRICT
FRESNO
CALIFORNIA
15
LAS VEGAS
ARIZONA
N
SCALE: APPROX.
0
88.5 KM
0
56 MILES

MT. HOPE
MOLYBDENUM PROJECT

STATE MAP OF
NEVADA

U.S. Department of the Interior
Bureau of Land Management

FIGURE
1-1


R51E
R52E
R53E
R54E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
PROPOSED LAND ACQUISITION AREA (PROJECT AREA)
PROPOSED FLPMA LAND SALE AREA
DIAMOND
DIAMOND
DIAMOND VALLEY
DIAMOND
KOBEH VALLEY
ANTELOPE VALLEY

——— PROPOSED LAND ACQUISITION AREA (PROJECT AREA)

▪▪▪▪▪▪▪▪▪▪▪ ESTIMATION OF APPROXIMATE FEDERAL LAND POLICY AND MANAGEMENT ACT (FLPMA) SALE AREA

Nevada
MAP AREA

0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Km.
N

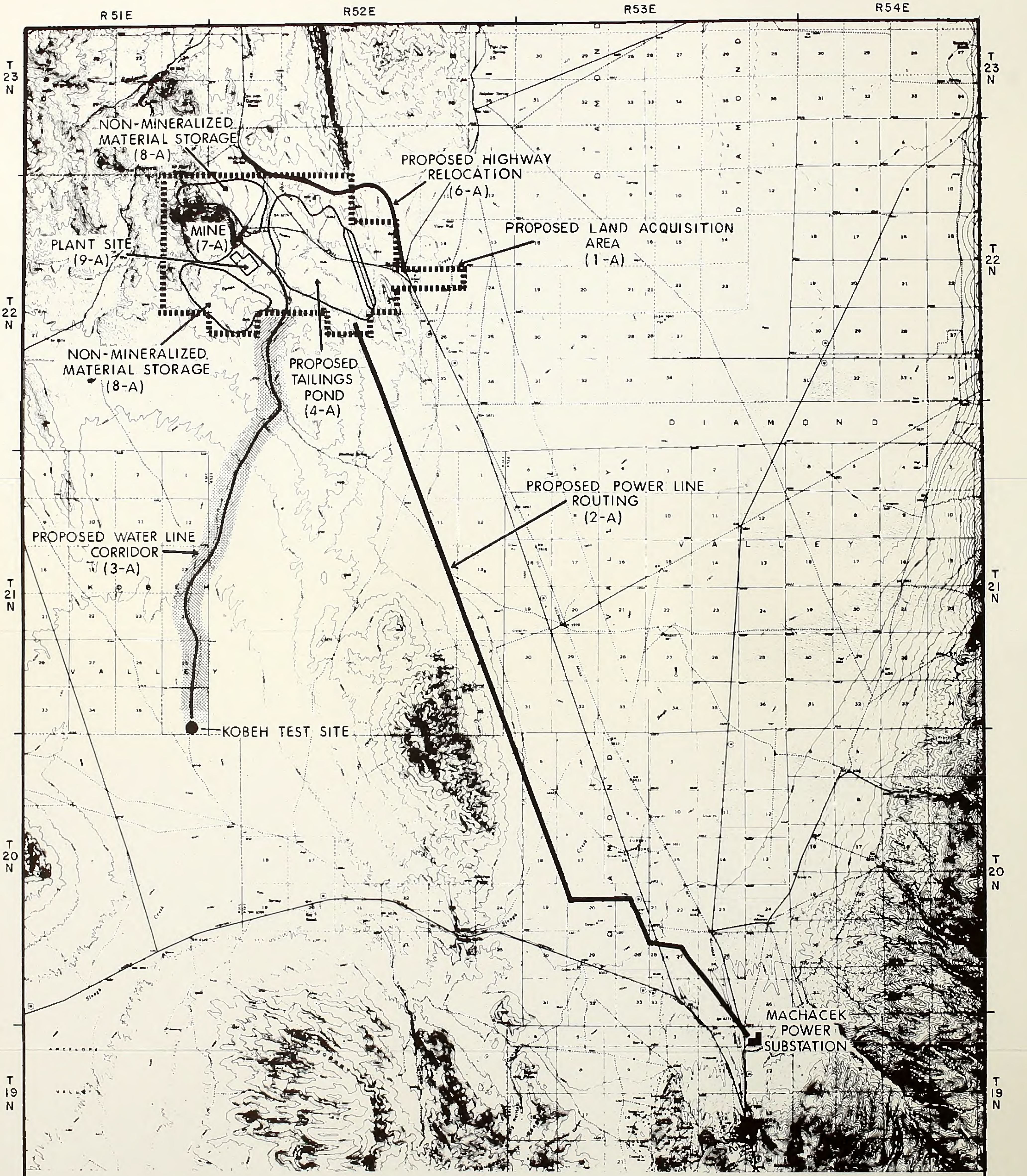
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., DIAMOND SPRINGS & EUREKA, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

PROPOSED PROJECT AND LAND ACQUISITION AREA MAP ALTERNATIVE I-A

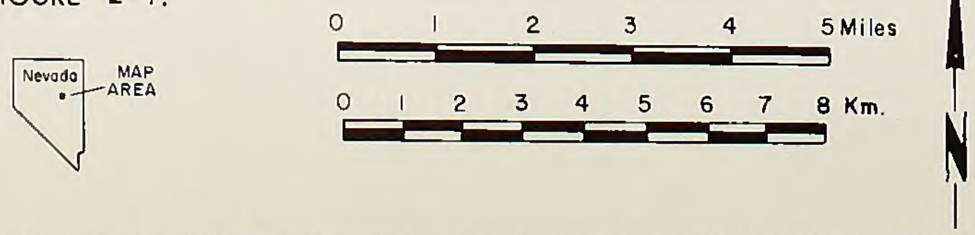
U.S. Department of the Interior
Bureau of Land Management

FIGURE 1-2


R51E
R52E
R53E
R54E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
NON-MINERALIZED MATERIAL STORAGE (8-A)
PROPOSED HIGHWAY RELOCATION (6-A)
MINE (7-A)
PLANT SITE (9-A)
PROPOSED LAND ACQUISITION AREA (1-A)
NON-MINERALIZED MATERIAL STORAGE (8-A)
PROPOSED TAILINGS POND (4-A)
DIAMOND
PROPOSED POWER LINE ROUTING (2-A)
VALLEY
PROPOSED WATER LINE CORRIDOR (3-A)
KOBEH VALLEY
KOBEH TEST SITE
MACHACEK POWER SUBSTATION

▮▮▮▮▮▮▮▮ PROPOSED LAND ACQUISITION AREA BOUNDARY

*NOTE: COMPONENT 5-A (HOUSING SUBDIVISION) NOT SHOWN.
ALTERNATIVE 1-A (INCLUDING FLPMA LAND SALE AREA) SHOWN
ON FIGURE 2-1.


0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Km.
Nevada
MAP AREA
N

BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., DIAMOND SPRINGS & EUREKA, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

REGIONAL STUDY AREA MAP
SHOWING
PROPOSED ACTION COMPONENTS

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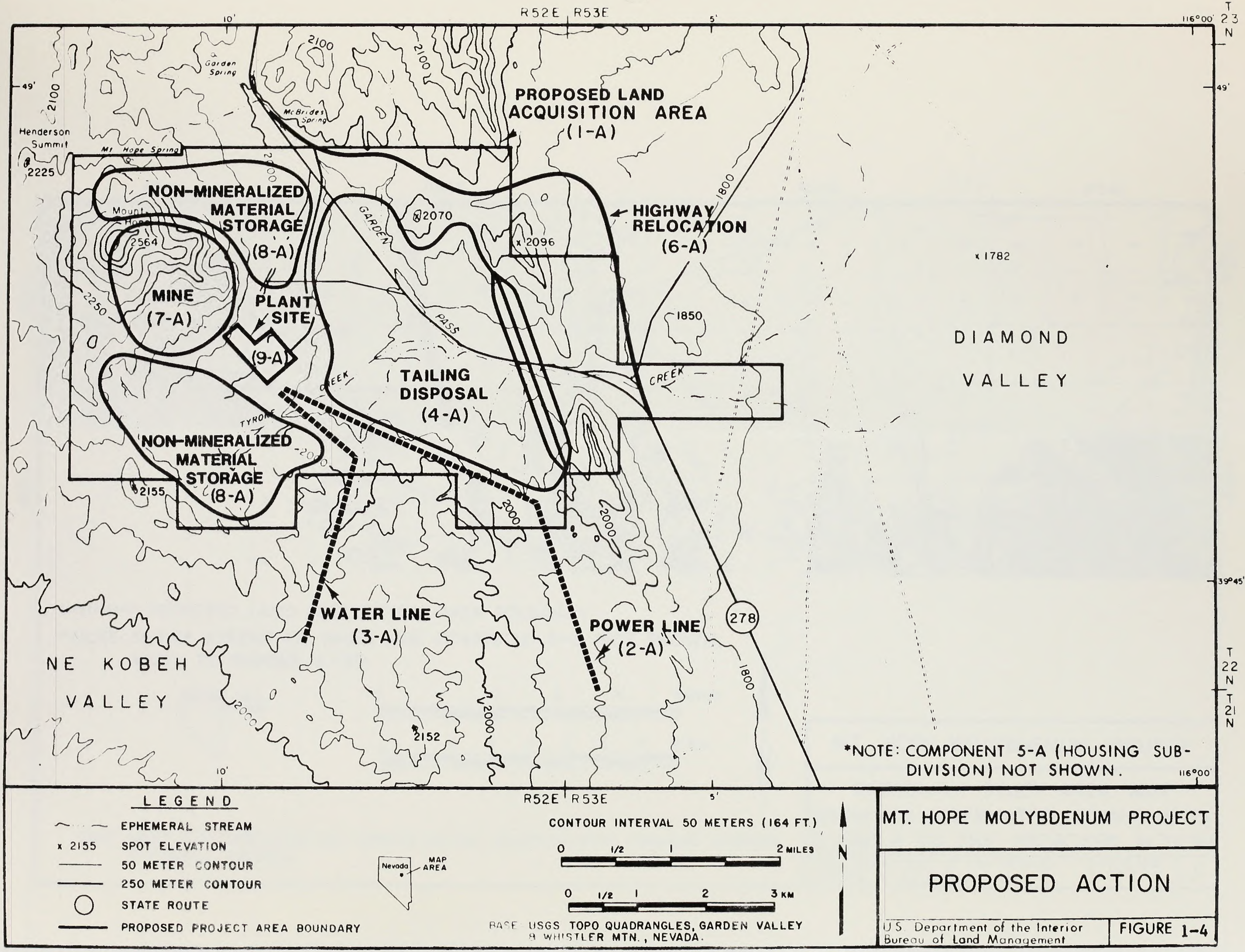
FIGURE 1-3

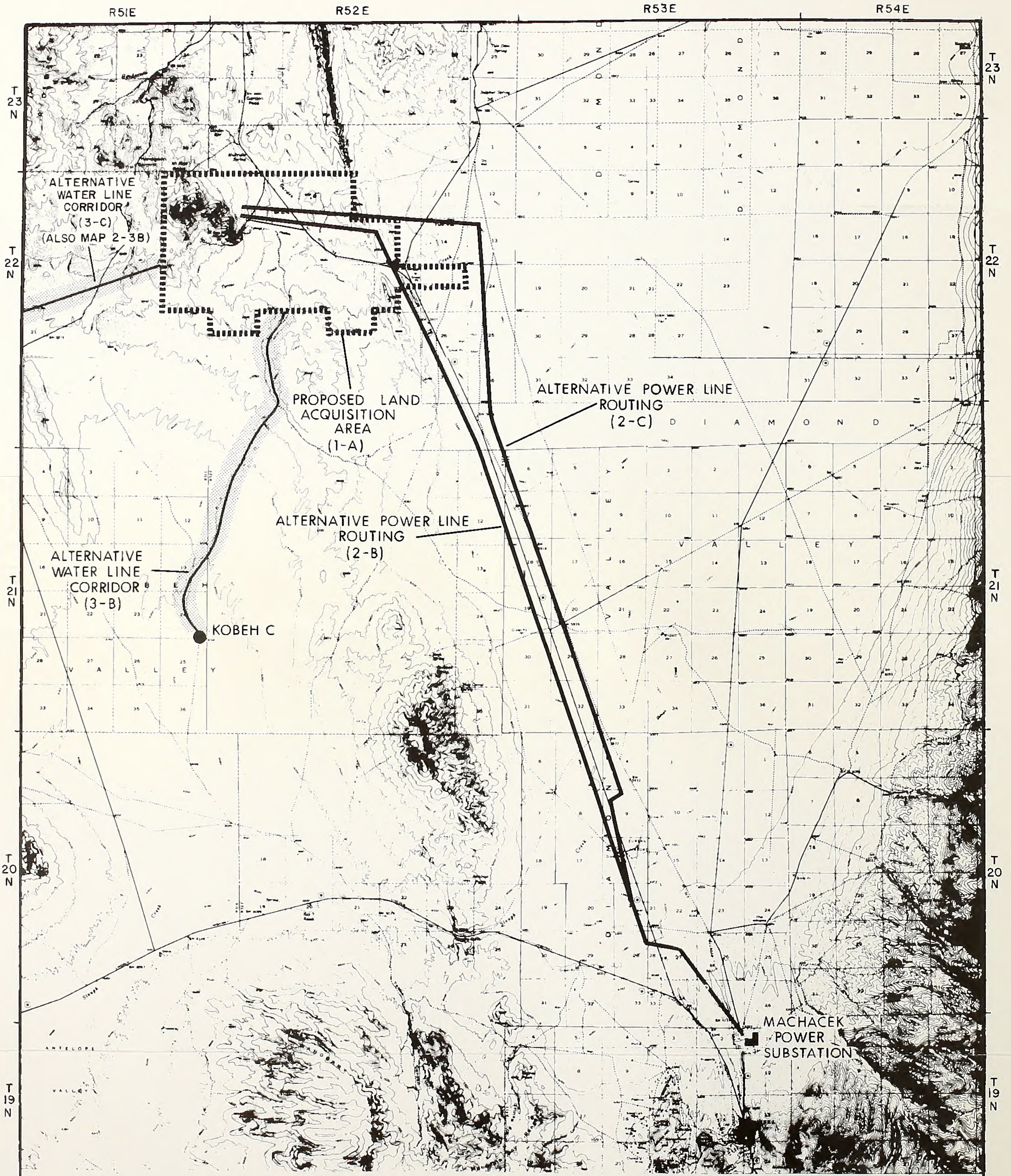

R52E R53E
10'
5'
116°00'
T 23 N
49'
T 22 N
T 21 N
39°45'
Garden Spring
McBrides Spring
Henderson Summit
2225
Mt Hope Spring
Mount Hope
2564
2250
2100
2000
2070
2096
1850
1800
1782
2155
2152
GARDEN
PASS
CREEK
TYRONE
PROPOSED LAND ACQUISITION AREA (1-A)
HIGHWAY RELOCATION (6-A)
NON-MINERALIZED MATERIAL STORAGE (8-A)
MINE (7-A)
PLANT SITE
(9-A)
TAILING DISPOSAL (4-A)
NON-MINERALIZED MATERIAL STORAGE (8-A)
WATER LINE (3-A)
POWER LINE (2-A)
278
DIAMOND VALLEY
NE KOBEH VALLEY
*NOTE: COMPONENT 5-A (HOUSING SUB-DIVISION) NOT SHOWN.
LEGEND
EPHEMERAL STREAM
x 2155 SPOT ELEVATION
50 METER CONTOUR
250 METER CONTOUR
STATE ROUTE
PROPOSED PROJECT AREA BOUNDARY
Nevada
MAP AREA
CONTOUR INTERVAL 50 METERS (164 FT.)
0 1/2 1 2 MILES
0 1/2 1 2 3 KM
N
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY & WHISTLER MTN., NEVADA.

MT. HOPE MOLYBDENUM PROJECT

PROPOSED ACTION

U.S. Department of the Interior
Bureau of Land Management

FIGURE 1-4


R51E
R52E
R53E
R54E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
ALTERNATIVE WATER LINE CORRIDOR* (3-C) (ALSO MAP 2-3B)
PROPOSED LAND ACQUISITION AREA (1-A)
ALTERNATIVE POWER LINE ROUTING (2-C)
ALTERNATIVE POWER LINE ROUTING (2-B)
ALTERNATIVE WATER LINE CORRIDOR (3-B)
KOBEH C
MACHACEK POWER SUBSTATION
DIAMOND VALLEY
KOBEH VALLEY
ANTELOPE VALLEY

▮▮▮▮▮▮▮▮▮▮ PROPOSED LAND ACQUISITION AREA BOUNDARY

*NOTE: ENTIRE EXTENT OF WATER LINE CORRIDOR 3-C NOT SHOWN, REFER TO FIGURE 2-3B

Nevada MAP AREA

0 1 2 3 4 5 Miles

0 1 2 3 4 5 6 7 8 Km.

N

BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., DIAMOND SPRINGS & EUREKA, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

REGIONAL STUDY AREA MAP SHOWING ALTERNATIVE COMPONENTS 2 AND 3 TO THE PROPOSED ACTION

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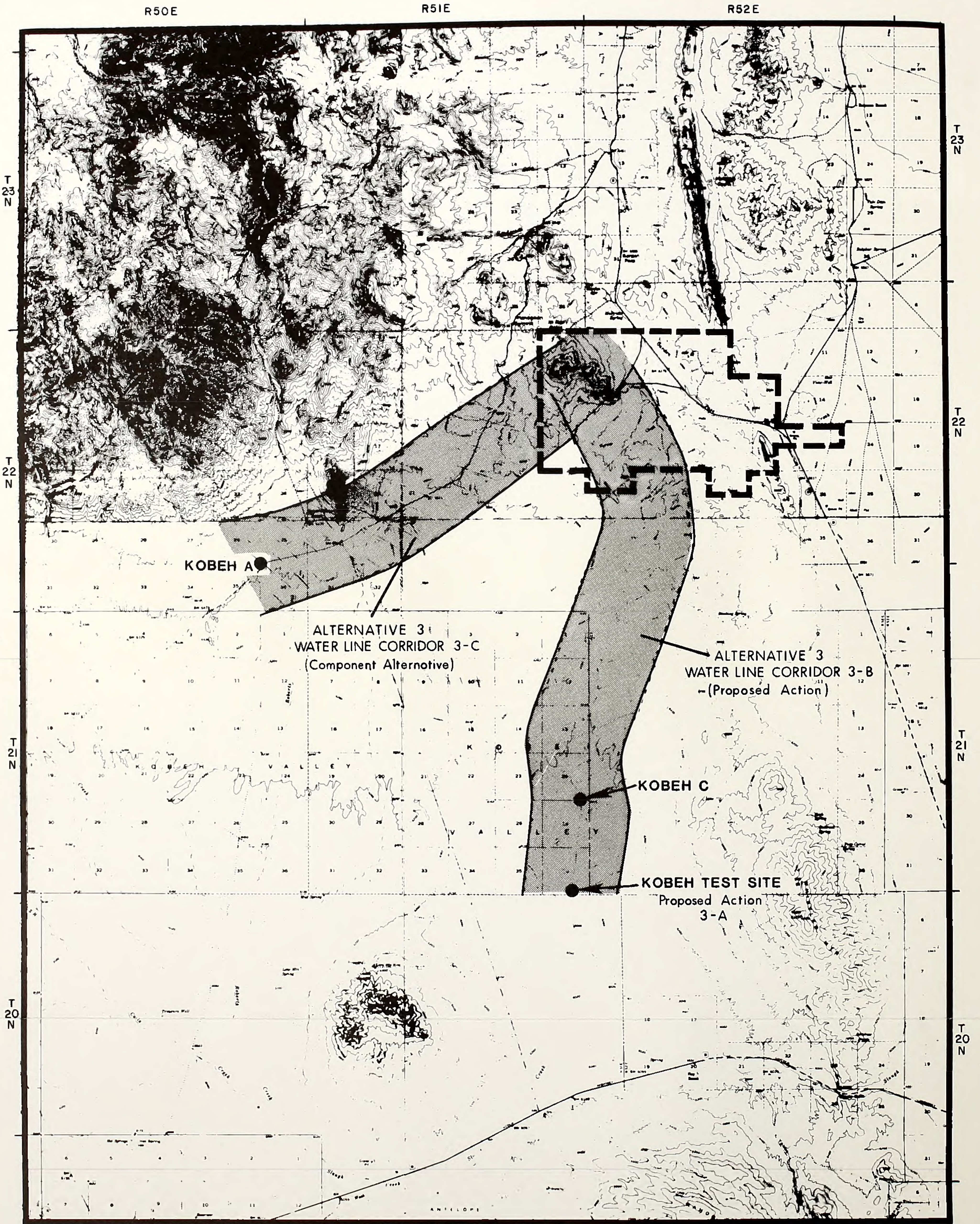
Bureau of Land Management

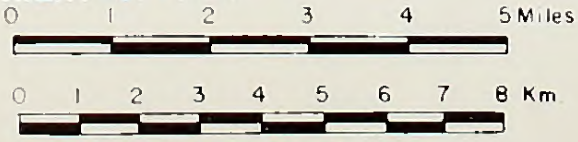
FIGURE 1-5


R50E
R51E
R52E
T 23 N
T 22 N
T 21 N
T 20 N
KOBEH A
ALTERNATIVE 3 WATER LINE CORRIDOR 3-C (Component Alternative)
ALTERNATIVE 3 WATER LINE CORRIDOR 3-B (Proposed Action)
KOBEH C
KOBEH TEST SITE Proposed Action 3-A
K O B E H V A L L E Y
ANTELOPE

▬ ▬ PROPOSED LAND ACQUISITION AREA BOUNDARY

▨ ALTERNATIVE WATER LINE RIGHT-OF-WAY

Nevada
MAP AREA


0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Km
N

BASE USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., ROBERTS CREEK MTN. & BARTINE RANCH, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

ALTERNATIVE ROUTING CORRIDORS FOR WATER LINE RIGHT-OF-WAY
(ALTERNATIVE 3 CONTINUED FROM FIGURE 2-3A)

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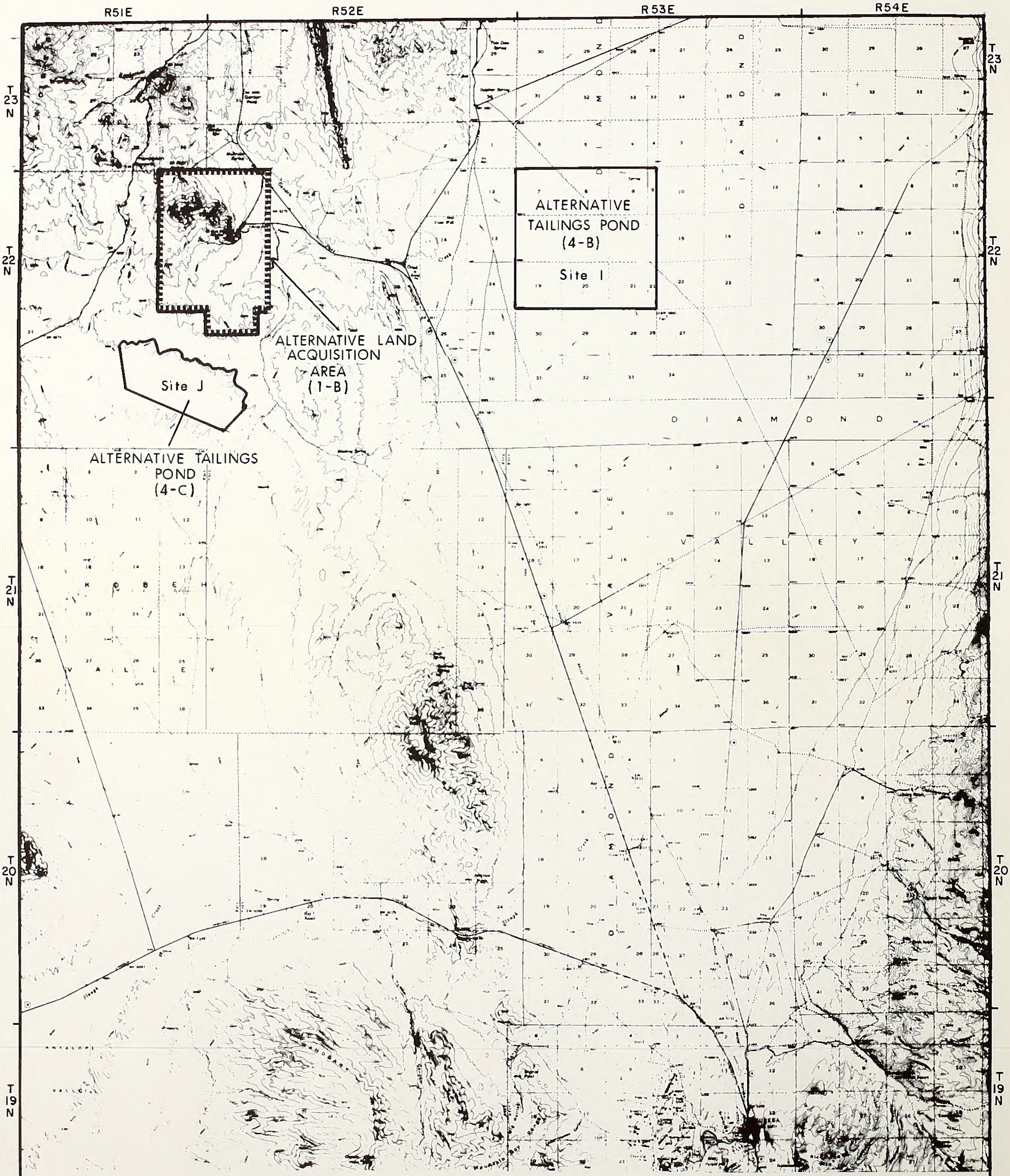
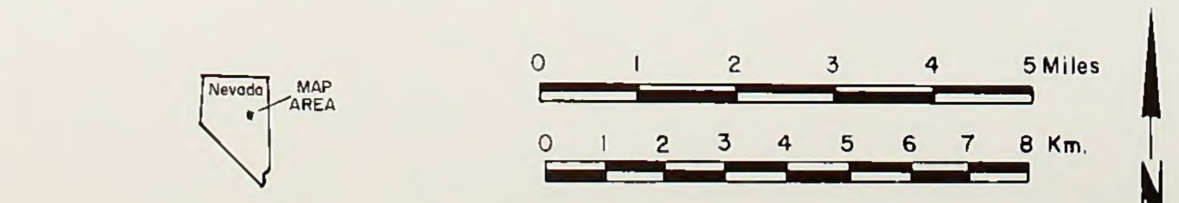
FIGURE 1-6


R51E
R52E
R53E
R54E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
ALTERNATIVE TAILINGS POND (4-B)
Site I
ALTERNATIVE LAND ACQUISITION AREA (1-B)
Site J
ALTERNATIVE TAILINGS POND (4-C)
DIAMOND
VALLEY
DIAMOND VALLEY
KOBEH VALLEY

ALTERNATIVE LAND ACQUISITION AREA BOUNDARY


Nevada
MAP AREA
0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Km.
N

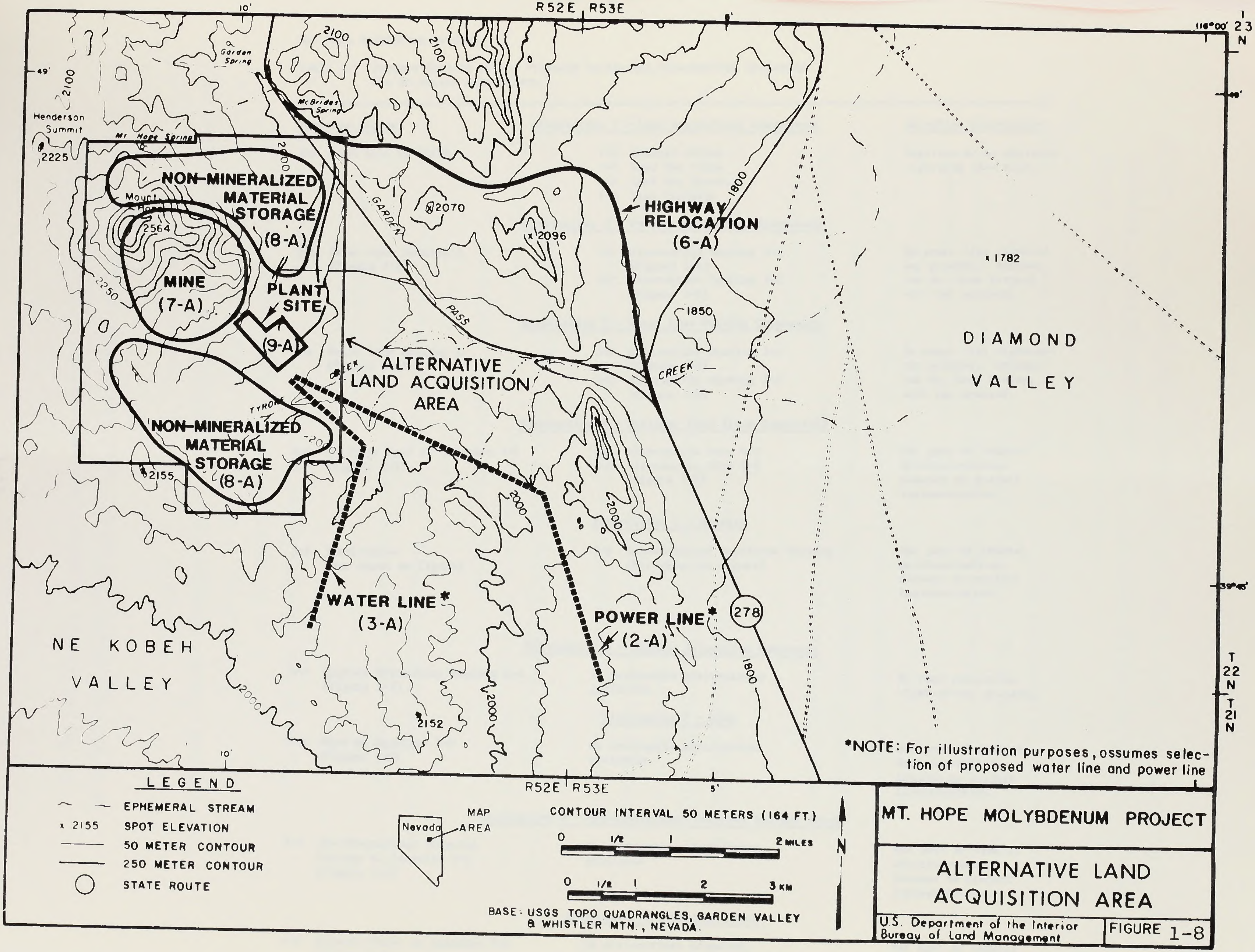
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., DIAMOND SPRINGS & EUREKA, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

REGIONAL STUDY AREA MAP SHOWING ALTERNATIVE COMPONENT 4 TO THE PROPOSED ACTION

U.S. Department of the Interior
Bureau of Land Management

FIGURE 1-7


R52E R53E
10'
5'
116°00'
T 23 N
T 22 N
T 21 N
49'
39°45'
Henderson Summit
2225
Garden Spring
McBrides Spring
Mt Hope Spring
Mount Hope
2564
2100
2000
2250
2070
2096
1850
1782
1800
2155
2152
GARDEN
PASS
CREEK
TYRONE
NON-MINERALIZED MATERIAL STORAGE (8-A)
MINE (7-A)
PLANT SITE (9-A)
ALTERNATIVE LAND ACQUISITION AREA
HIGHWAY RELOCATION (6-A)
WATER LINE* (3-A)
POWER LINE* (2-A)
278
DIAMOND VALLEY
NE KOBEH VALLEY
LEGEND
EPHEMERAL STREAM
x 2155 SPOT ELEVATION
50 METER CONTOUR
250 METER CONTOUR
STATE ROUTE
Nevada
MAP AREA
CONTOUR INTERVAL 50 METERS (164 FT.)
0 1/2 1 2 MILES
0 1/2 1 2 3 KM
N
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY & WHISTLER MTN., NEVADA.

*NOTE: For illustration purposes, assumes selection of proposed water line and power line

MT. HOPE MOLYBDENUM PROJECT

ALTERNATIVE LAND ACQUISITION AREA

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Bureau of Land Management

FIGURE 1-8

Table 1-1 Summary Details of the Proposed Action and Alternatives Including the No Action Alternative

Proposed Action	Alternatives	No Action Alternative
	Alternative 1 - Land Acquisition Components	
1-A Land Sale by FLPMA	1-B Mineral Claims 1-C Land Use Lease 1-D Land Use Permit 1-E Land Exchange	Negative or no decision regarding land sale.
	Alternative 2 - Power Line Routing Components	
2-A Power Line Routing A (Figure 1-2)	2-B Alternative Routing 2-B (Figure 1-4) 2-C Alternative Routing 2-C (Figure 1-4)	No power line right-of way granted. Assumes the Mt. Hope Project will not proceed.
	Alternative 3 - Water Line Routing Components	
3-A Water Line Routing A (Figure 1-2)	3-B Alternative Routing 3-B (Figure 1-4) 3-C Alternative Routing 3-C (Figure 1-5)	No water line right-of-way granted. Assumes the Mt. Hope Project will not proceed.
	Alternative 4 - Tailings Pond Sites Components	
4-A Tailings Pond at Location 4-A (Figure 1-3)	4-B Alternative Site 4-B 4-C Alternative Site 4-C (Figure 1-4)	Not part of federal decision-making. Assumes no project implementation.
	Alternative 5 - Housing	
5-A Subdivision (Not shown on figure)	5-B Decentralized Workforce Housing (Not shown on figure)	Not part of federal decision-making. Assumes no project implementation.
	Alternative 6 - Highway Relocation Component	
6-A Highway Relocation Routing 6-A (Figure 1-3)	No reasonable alternatives available	No road relocation right-of-way granted.
	Alternative 7 - Mine	
7-A Mine at Location 7-A (Figure 1-3)	No reasonable alternatives available	Not part of federal decision-making. Assumes no project implementation.
	Alternative 8 - Non-Mineralized Material Storage Areas	
8-A Non-Mineralized Material Storage at Location 8-A (Figure 1-3)	No reasonable alternatives available	Not part of federal decision-making. Assumes no project implementation.
	Alternative 9 - Process Plant	
9-A Process Plant at Location 9-A (Figure 1-3)	No alternatives proposed. (Proposed action is worst-case. See text).	Not part of federal decision-making. Assumes no project implementation.

4) Miller, J. F., Frederick, R. H., and Tracey, R. J. 1973. Precipitation-Frequency Atlas of the Western United States, Volume VII-Nevada, National Oceanic and Atmospheric Administration.

5) Rush, F. B., and Schroer, C. V. 1970. "Water Resources of Big Smoky Valley, Lander, Nye, and Esmeralda Counties, Nevada," Water Resources Bulletin No. 41, Department of Conservation and Natural Resources, Division of Water Resources, State of Nevada.

6) Rush, E. F., Everett, D. E. 1964. Groundwater Resources - Reconnaissance Series. Report 30. Groundwater Appraisal of Monitor, Antelope and Kobeh Valleys, Nevada. Dept. of Conservation and Natural Resources, State of Nevada.

7) Soil Conservation Service (SCS), Archer. 1980. Soil Survey of Diamond Valley Area - Parts of Eureka, Elko and White Pine Counties, Nevada. U.S. Deptartment of Agriculture, Soil Conservation Service and U.S. Department of the Interior, Bureau of Land Management in cooperation with University of Nevada Agricultural Experiment Station.

8) Strojie, William F. 1968. Notes on Elko County (Nevada) Weather. Physical Sciences Publication No. 5, Desert Research Institute, Technical Report Series P, University of Nevada, Reno, Nevada.

9) Eureka County Extension Service. 1983. Cooperative Extension Service. University of Nevada, Reno. March. (Information input for weather in Diamond Valley, Nevada.)

10) Baskett, Ronald L. 1983. American Mining Congress Report on Fugitive Dust Emission Factors for the Mining Industry.

11) Nevada Division of Environmental Protection (NDEP). 1983. McCleary, G. Personal Communication.

12) Trijonis, J., and D. Shapland. 1979. Existing Visibility Levels in the U.S. EPA-450/5-79-010, U.S. Environmental Protection Agency.

13) U.S. Environmental Protection Agency. 1982. AP-42 Compilation of Emissions Factors, Supplement 13.

Data sources specific to analysis of impacts are referenced as appropriate in Chapter 3.0.

1.4 Impact Analyses Methodology

In the event of any discrepancies between this technical report and the EIS, the material presented in the EIS shall supercede that which is presented in this technical report.

1.4.1 Air Quality Modeling

The model chosen for analysis of the air quality impacts to the existing Mt. Hope environment as a result of the proposed mine and process plant complex was the Valley Model. This particular model was chosen as being the most appropriate due to the rough nature of the subject terrain and the mix of emissions, including total suspended particulates (TSP), sulfur dioxide (SO_2) and nitrogen oxides (NO_x), which are all considered relatively inert pollutant species.

The Valley model is recommended by the U.S. Environmental Protection Agency (EPA) for modeling in rough terrain and is recommended for use in the Mt. Hope area of Nevada (NDEP, G. McCleary, Personal communication, 1983). It follows terrain for neutral or unstable flows, fixes plume at one altitude for stable flows, and provides annual and 24-hour average concentrations at preselected receptors distributed over a gridded network.

In the present application, ground level concentrations were simulated at a total of 112 receptors to a distance of seven kilometers from the proposed Mt. Hope site. Simulations were done under worst case conditions of 24-hour and annual averages.

1.4.2 Fugitive Dust Evaluation

The proposed mining activity would generate fugitive dust emissions above background levels due to activities such as excavation, blasting, earth moving, milling and principally vehicular traffic on unpaved surfaces.

Road dust would result from the pulverization of surface material by the force of a vehicle's wheels. The turbulence caused by the passing of the vehicle would provide the lifting energy. Among the factors which would affect the volume of fugitive emissions would be volume and type of traffic, vehicle speed, road surface texture and surface moisture.

An analysis was conducted of all proposed action activities in terms of surface acreage disturbed and duration on a year by year basis for the initial five years of operation. Sixteen categories of activity were identified. Estimates were provided for wind erosion loss based on soil type, soil erodibility, surface roughness, climactic factor, fetch and percent of vegetative cover. Estimates of erosion in tons per acre per year were derived, following methodology as described in U.S. EPA AP-42, Technical Report 13 of HDR, 1980, and Baskett, R.L., 1983, American Mining Congress (AMC) Report on Fugitive Dust Emission Factors for the Mining Industry.

An ancillary analysis of aeolian losses of soil is provided in Technical Report No. 5, Soil Resources, Section 3.3.3, pp. 3-18 to 3-21.

1.4.3 Visibility Impairment Analysis

Calculations of visibility impairment were based on emissions input data supplied by EXXON. The analysis procedure used has been described in the EPA's Workbook for Estimating Visibility Impairment (1980). The The procedure is based on a series of conservative screening tests using simple algorithms and nomograms provided in the workbook. Inputs to the analysis include pollutant emissions rates, atmospheric stability and distance from source.

1.4.4 Air Quality Impact Assessments on Soils and Vegetation

The soils and vegetative groundcover not directly affected by physical removal or burial by mining operations, but subject to potential impacts related to changes in air quality, were reviewed relative to potential for impact. The results of air quality modeling of project emissions (SO_2, NO_2, TSP) provided a basis for calculating the potential for acidification of soils which could cause leaching of the biologically important soil constituents of calcium, magnesium and potassium. The methodology of review entailed consideration of the modeled air quality dispersion results relative to National Ambient Air Quality Standards (NAAQS) and the environmental impact protection afforded by those standards.

CHAPTER 2.0

BASELINE METEOROLOGY AND AIR QUALITY DESCRIPTION

2.0 REGIONAL METEOROLOGY

The climate of east-central Nevada falls under the classification of mid-latitude steppe and mid-latitude desert (Houghton et. al., 1975). This classification is characterized by a continental temperature regime with semi-arid to arid conditions. The most significant features of the region are considerable sunshine, low annual precipitation in the valleys; heavy snowfall at higher elevations, low relative humidity, and extreme daily ranges of temperature (Henningson, Durham and Richardson (HDR), 1980a).

The air masses that move generally eastward across Nevada are typically deficient of moisture as two major topographical barriers, the Rocky Mountains and Sierra Nevadas, influence the climate of the Great Basin and are responsible for the arid to semi-arid country. Because the region lies between the massive Sierra Nevada to the west and the Rocky Mountains to the east, it is cut off from most precipitable water vapor. The Sierras effectively "drain" much of the moisture from storm clouds moving from the Pacific (SCS, 1980). The high elevational topography of the Rocky Mountains divert cold Canadian airmasses from reaching the Great Basin. Occasionally, however, cold airmasses in winter spill over into Nevada and result in below-zero temperatures (SCS, 1980).

Water vapor must be "pumped in" from the Pacific Ocean in advance of storms or be drawn in behind them if any appreciable amount of precipitation is to occur. Because of this general deficiency in available moisture (except sometimes during spring and early summer), the rapidly developing severe storm of the more humid regions is only an isolated possibility in Nevada (Strojie, 1968). Most precipitation in central Nevada is from frontal storms in winter and convective storms in summer. Frontal storms are generally low intensity, long duration events covering large areas. Convective storms are generally high intensity, short duration events of limited areal extent (Hydro-Search, Inc., 1982).

During the cold months of November through March (although freezing temperatures and snow may occur even late in August or June), nearly all precipitation is in the form of snow, with seldom more than three or four hours of rain in advance of some storms (Strojie, 1968). During the months when snow or frozen ground covers the region, weather developments are of stable types, with nearly all the precipitation that occurs in the lower valleys being in advance of eastward moving troughs or lows, or as an extension of cyclonic flow from offshore (Strojie, 1968).

Because the region has a fairly high altitude (and therefore low actual pressure) further influenced strong topographic effects of the mountain-valley terrain, local precipitation processes may be enhanced (Strojie, 1968). Though the mountain ranges serve as partial barriers of storms during the winter months, they often represent geographical troughs aiding the production of precipitation. These features are of special significance in the spring and early summer when melting snow and thawing ground usually provide regionally available moisture; and heating of the valley surfaces adds to the vertical instability of the flow of cool air from oceanic anticyclones (Strojie, 1968). Thunderstorms therefore begin to occur in spring and early summer.

Fall differs from spring, as a transitional season, in two respects. The fall is characteristically very dry over the mountains and vertical instability is at a minimum during late fall since much of the higher-level areas are frozen or snow covered (Strojie, 1968).

Considerable differences in amounts and magnitude of precipitation exist at different elevations. Diamond Valley (Figure 1-2, east and east southeast of Mt. Hope), for instance, has an average annual precipitation which varies from 8 to 12 inches (20 to 30 cm.) while the surrounding mountains have an annual precipitation of 16 to 20 inches (41 to 51 cm). (Hydro-Search, Inc., 1982.)

Differences in elevation also affect the persistence of snow. Two or even one thousand feet of difference in elevation is of great importance with respect to the amounts and persistence of snow. The greater amounts of snow

gained and preserved in a high locality also helps maintain a difference; once snow packs in, the temperatures may seldom exceed 35° F (Strojie, 1968).

The general circulation pattern of weather systems over Nevada is summarized by James (1981), and appears as follows:

Winter: Periods of fair weather are associated with Great Basin highs, but Pacific fronts also move inland in the prevailing westerlies aloft, bringing precipitation and frequent weather changes.

Spring: Precipitation and changeable weather are common largely because of Great Basin lows, which are frequent in the spring. In late spring, the subtropical high brings drought to southern Nevada.

Summer: Clear dry weather is dominant due to the subtropical high and the lack of available moisture from the Pacific Ocean. Precipitation occurs as occasional showers in moist air from the tropical oceans. Thunderstorm frequency increases over eastern Nevada.

Fall: Fair weather is dominant, with frequent Great Basin highs, but Pacific fronts and Great Basin lows cause precipitation and changeable weather, especially in the late fall (Houghton et al. 1975:19).

2.2 Regional Climatic Features

2.2.1 Precipitation

Large differences in precipitation occur between the valleys and mountain ranges. The higher altitudes receive more precipitation while the valleys receive the least precipitation. Therefore, the valleys are commonly semi-arid to arid and the higher elevations are subhumid to semi-arid. Some of the higher mountains may receive as much as 25 inches (in) (63.5 cm) of annual precipitation as opposed to as little as 3.3 in (8.3 cm) for some of the valleys.

Annual average precipitation ranges from 4.0 to 16.0 in (10 to 40 cm) (HDR, 1980b). Most of the precipitation occurs as snowfall and is moderately

distributed over the winter months of November through April (Strojie, 1968). Some of the higher areas may have a mean annual snowfall between 39.4 to 78.7 in (100 and 200 cm) (James, 1981). An average 40 to 60 inches of snow falls each year. As much as 30 inches in one month and 134 inches in a year have been recorded (SCS, 1980).

The remaining precipitation is supplied by thunderstorms from June to September. These are usually of short duration and localized. About 25 to 30 days a year produce thunderstorms; three or four days a year are associated with hail (SCS, 1980), but damage is minimal since the hailstones are commonly very small.

The occurrence and magnitude of precipitation events is related to topography and establishes different zones of annual precipitation in the area. The division between the zones of less than 8 inches and 8 to 12 inches of precipitation was delineated at the 5,800-foot contour and the 6,000-foot contour, between the 8 to 12 inches and 12 to 15 inches of precipitation at the 7,000-foot contour, between 12 to 15 inches and 15 to 20 inches of precipitation at the 8,000-foot contour, between the 15 and 20 inches and the over 20 inches of precipitation at the 9,000-foot contour (Eakin, 1961). The average precipitation assumed for the respective zones beginning with the zone of less than 8 inches is 7 inches, 10 inches, 13.5 inches, 17.5 inches and 21 inches (Eakin, 1961).

Precipitation data for Eureka are shown in Tables 2-1, 2-2, 2-3, 2-4 and 2-5. Precipitation data for Diamond Valley are shown in Table 2-6 and precipitation data for Beowawe (approx. 75 miles northwest of Eureka) are shown in Table 2-7.

Comparison of Table 2-5 (Eureka data) to Table 2-7 (Beowawe data) reveals that precipitation, especially snowfall, is greater at Eureka than at Beowawe. The difference in precipitation is due largely to the orographic or "mountain" effect at Eureka (Conger, 1974). This involves large masses of air being forced to rise when landform barriers, such as mountain ranges, lie across the path of the wind. Since water vapor is largely restricted to the lower layers of atmosphere and rapidly decreases in amount upward, heavy

Table 2-1 Average Monthly and Annual Precipitation (in inches) for Eureka, Nevada

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Eureka 1/	1.11	1.08	1.49	1.33	1.49	.86	.73	.66	.66	.89	.66	.82	11.78

1/ Altitude, 6,550 feet. Period of record: 1889, 1891, 1902-18, 1922-30, 1939-42, 1953-60 (continuing). Partial record in 1888, 1890, 1892-94, 1919-21.

Source: Published records of the U.S. Weather Bureau

Table 2-2 Maximum and Minimum Monthly and Annual Precipitation (in inches), at Eureka, Nevada (period of record 1888-1960 discontinuous).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Maximum	1.51	1.22	1.67	3.04	2.16	2.31	1.75	2.66	0.92	2.50	1.81	2.31	23.86
Minimum	.70	.18	.84	.22	.32	.96	.81	.34	.00	.55	.42	.79	6.13

Source: Published records of the U.S. Weather Bureau

Table 2-3 Precipitation Data (in inches) for Eureka, Nevada, (period of record, 1902-1930)

Month	Precipitation	
	One year in 10 will have -	
	Less than -	More than -
	Inches	Inches
January	0.20	2.45
February	0.34	1.90
March	0.30	2.90
April	0.35	2.42
May	0.10	3.46
June	0.08	2.38
July	0.01	1.92
August	0.01	1.65
September	0.01	1.46
October	0.01	2.23
November	0.01	1.50
December	0.19	1.80

Source: SCS, 1980

Table 2-4 Annual Precipitation (in inches) for Eureka, Nevada, 1953-1959

Year	Inches
1953	7.36
1954	9.09
1955	e 10.48
1956	6.33
1957	e 14.54
1958	6.83
1959	7.67

e/ Estimated by Weather Bureau.

Source: Published records of the U.S. Weather Bureau

Table 2-5 Monthly Precipitation Data (in inches) for Eureka, Nevada, 1969-1971

	1969			1970			1971	
Month	Precip.	Snow	Month	Precip.	Snow	Month	Precip.	Snow
Jan.	1.63	----	Jan.	.27	32.	Jan.	.65	10.0
Feb.	2.72	----	Feb.	.25	1.1	Feb.	1.29	16.5
Mar.	1.36	----	Mar.	.91	11.1	Mar.	.91	11.5
Apr.	.72	.5	Apr.	1.05	14.3	Apr.	3.10	21.0
May	.42		May	.36	T	May	3.70	13.5
June	4.37		June	1.19		June	.53	2.0
July	1.18		July	2.27		July	.21	
Aug.	.96	1.54	Aug.	1.58		Aug.	.25	
Sept.	.28	1.01	Sept.	1.23	2.0	Sept.	.38	----
Oct.	1.38	1.14	Oct.	.44	2.5	Oct.	.52	----
Nov.	.73	.27	Nov.	2.49	12.0	Nov.	2.31	----
Dec.	1.61	1.85	Dec.	1.00	17.5	Dec.	2.20	----

Symbols: T = a trace, too small to measure. ---- = no data.

Source: Published records of the U.S. Weather Bureau

Table 2-6 Precipitation Data (in inches) for Diamond Valley, Nevada, 1965-1968

	Average Total Precipitation
	Inches
January	0.38
February	0.65
March	1.03
April	0.59
May	1.25
June	0.83
July	0.60
August	0.45
September	0.52
October	0.65
November	0.63
December	0.46
Year	8.03

Source: SCS, 1980

Table 2-7 Monthly Precipitation Data (in inches) for Beowawe, Nevada, 1969-1971

1969			1970			1971		
Month	Precip.	Snow	Month	Precip.	Snow	Month	Precip.	Snow
Jan.	0.29	----	Jan.	1.14		Jan.	0.30	
Feb.	2.17	10	Feb.	0.00		Feb.	0.45	
Mar.	0.42	----	Mar.	0.00		Mar.	0.55	----
Apr.	0.46		Apr.	0.42		Apr.	0.46	T
May	0.27		May	0.20		May	2.62	
June	3.30		June	1.69		June	0.00	
July	0.14		July	0.00		July	0.20	
Aug.	0.00		Aug.	0.20		Aug.	0.08	
Sept.	T		Sept.	0.00		Sept.	0.18	
Oct.	T		Oct.	0.50		Oct.	0.00	
Nov.	T		Nov.	0.92		Nov.	1.16	
Dec.	1.75		Dec.	1.05		Dec.	2.15	
Ann'l	9.45	----	Ann'l	6.12		Ann'l	8.15	

Symbols: T = a trace, too small to measure. ---- = no data.

Source: Published records of the U.S. Weather Bureau

orographic precipitation is the result of the forced ascent of air associated with the blocking effect of landform obstacles (Conger, 1974).

Diamond Valley has an average annual precipitation of 8 in (20 cm). Precipitation maximum for the valley is generally in the spring and as much as 3 in (7.6 cm) has fallen in 24 hours.

The distribution of estimated average annual precipitation for Kobeh Valley (Figure 1-2, south of Mt. Hope) is delineated as follows: 12 inches at 7,000 feet, 15 inches at 8,000 feet, and 20 inches at 9,000 feet (Rush and Everett, 1964).

2.2.2 Temperature

Extreme seasonal and daily temperature ranges are common. The area has cold winters and hot summers and often experiences a large diurnal temperature range caused by bright and abundant sunshine rapidly warming the relatively thin dry air during daylight, followed by rapid cooling after sunset. Daily temperature ranges during all seasons may be as much as 40°F (22°C) and frequently exceed 50°F (28°C) during the fall season (Rush and Schroer, 1970).

The valleys may experience maximum daily temperature in excess of 90°F during the summer months. Typical annual temperature extremes in the valleys of central Nevada range from -10°F to 97°F (-23.3°C to 36°C) (Rush and Everett, 1964).

The southern end of Eureka County averages only 18 days a year with maximums of 90°F (32°C) or above, while in the north the average is over 50 days a year. Much of the county, however, fails to record a 100°F (37.7°C) maximum during any given year (Conger, Sharp, Krater, Engstrom and Assoc., 1974).

The climatic summary of records of temperature at Eureka, prior to 1931, show an average annual temperature of 47.4°F (8.5°C). The monthly annual average of highs and lows for 1979 indicate a value of 47.5°F. A current

average is not given because of incomplete records since 1931 1/. However, it seems likely that the earlier average of about 47°F approximates the long-time average. The extremes of temperature for Eureka (1902-1930) are 110° and -26°F (43.3°C and -32.2°C) (Eakin, 1961).

The coldest and warmest months are January and July, respectively. During the period of record 1902-1930, (Table 2-8), Eureka had an average daily high in January of 38.2°F (3.4°C) and an average daily low of 16.2°F (-8.7°C) in July the average daily high was 87.2°F (30.6°C) and the average daily low was 54.4°C (12.4°C). Eureka, in spring, will generally experience temperatures of 32° (0°C) or lower earlier than September 4 in one year out of 10, earlier than September 9 in 25 years out of 100, and earlier than September 21 in five years out of 10. Table 2-12 shows temperature data for Diamond Valley (1965-1968).

Temperature differences between the basin and range portions of Eureka County are shown in Tables 2-13 and 2-14. Beowawe lies at an elevation of 4,700 feet and is representative of the basin areas, whereas Eureka lies at an elevation of 6,540 feet and is representative of the higher elevations or range areas. Eureka, 1,840 feet higher in elevation than Beowawe, exhibits recorded temperatures several degrees cooler. The differential represents a general characteristic in meteorology in which temperatures drop 3.3°F (1.8°C) for each 1,000 feet rise in elevation.

Locally, Diamond Valley is influenced by the surrounding mountain ridges. The abrupt rise to the mountain peaks is conducive to frequent inversions in the valley, as cold air drains from the mountainsides to the valley floor (SCS, 1980). When this happens, nighttime temperatures are cooler on the

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1/ Recent climatological data recording has undergone a variety of changes in actual type of data recorded through Diamond Valley and Eureka. Tables 2-9 thru 2-17 present the WRC interpretation of climatological data received from the Eureka County Cooperative Extension Services for the period of 1967-1982 (intermittent years presented dependent on data type). Appendix 3-A presents the Eureka County Cooperative Extension data on an as-received basis.

Table 2-8 Temperature Data (°F) for Eureka, Nevada, (period of record, 1902-1930)

Month	Average Daily High	Average Daily Low	Two Years in Ten Will Have About Four Days With - Maximum Temperature Equal to or Higher Than-	Two Years in Ten Will Have About Four Days With - Minimum Temperature Equal to or Lower Than-
	°F	°F	°F	°F
January	38.2	16.2	50.4	0.8
February	41.6	19.4	51.6	5.4
March	48.5	24.0	61.9	11.0
April	59.1	29.6	71.2	18.3
May	66.4	36.5	77.5	25.1
June	78.1	44.2	89.1	31.8
July	87.2	54.4	93.1	41.7
August	85.2	52.8	91.4	43.0
September	76.0	44.8	85.8	31.4
October	63.6	34.4	75.3	23.3
November	51.5	26.0	64.6	11.4
December	40.8	19.0	53.6	2.1
Year	61.4	33.4	-----------	----------

Source: SCS, 1980

Table 2-9 Annual Precipitation, 1976-1982, As Interpreted From Appendix 3-A Data

Year	Diamond Valley		Eureka		Maximum Month(s)
	(inches)	(cm)	(inches)	(cm)	
1982	11.79	29.95	-	-	September, March
1981	4.89**	12.42	-	-	May, October
1980	10.60**	26.92	-	-	May, September
1979	7.75	19.68	(9.74)	24.74	May, July - Aug.
1978	7.89**	20.04	-	-	September, April
1977	7.23	18.36	(12.99)	32.99	May, August
1976	7.17**	18.21	-	-	July, September

(* Includes Snow)

(** Assumes Diamond Valley)

Source: WRC EIS Team, derived from Appendix 3-A data.

Table 2-10 Diamond Valley Maximum/Minimum and Percent Monthly Precipitation, 1976-1982, As Interpreted From Appendix 3-A Data

Record Year		Year Total		Maximum		Percent	Minimum Month		
		(inches)	(cm)	(inches)	(cm)			(inches)	(cm)
(Sept).	1982	11.79	29.95	3.38	8.58	28.7	(Feb)	0.11	0.28
(May)	1981	4.89	12.42	1.6	4.06	32.7			
(Oct.)				1.39	3.53	28.4			
(May)	1980	10.60	26.92	3.61	9.17	34.0			
(Sept.)				1.58	4.01	14.9			
(Jan.)				1.32	3.35	12.5			
(May)	1979	7.75	19.68	1.26	3.20	16.3	(June)	0.13	0.33
(July)				1.24	3.15	16.0			
(Aug.)				1.23	3.12	15.9			
(Sept.)	1978	7.89	20.04	2.49	6.32	31.6			
(April)				1.52	3.68	19.3			
(May)	1977	7.23	18.36	2.09	5.31	28.9	(Oct)	0	
(Aug.)				1.78	4.52	24.6			
(July)	1976	7.17	18.21	1.54	3.91	21.5	(Dec)	0	
(Sept.)				1.32	3.35	18.4			

Source: WRC EIS Team

Table 2-11 Diamond Valley Precipitation Percent by Monthly Period, 1976 - 1982, as Interpretated From Appendix 3-A Data

	1982 %	1981 %	1980 %	1979 %	1978 %	1977 %	1976 %
April - June	18.41	43.35	50.0	25.0	25.9	40.7	23.99
May - August	32.57	38.45	51.98	49.80	11.28 (with September) 42.33	65.42	39.75
Frost Free Period June, July, Aug.	23.75	5.72	17.92	33.55	4.69	36.51	33.19

Source: Appendix 3-A

Table 2-12 Temperature Data (°F) for Diamond Valley, Nevada, 1965-1968

Month	Temperature	
	Average Daily High 1/	Average Daily Low 1/
	°F	°F
January	36.8	8.8
February	41.9	14.4
March	48.5	20.2
April	60.2	25.3
May	68.0	31.8
June	78.5	40.0
July	87.4	47.4
August	86.7	44.0
September	78.3	38.5
October	63.3	29.0
November	54.7	20.0
December	38.9	9.3
Year	61.9	27.4

1/ Estimated.

Source: SCS 1980

Table 2-13 Monthly Temperature (°F) for Eureka, Nevada, 1969-1971

1969		1970		1971	
Month	Temperature	Month	Temperature	Month	Temperature
Jan.	32.3	Jan.	29.7	Jan.	29.0 M
Feb.	26.6	Feb.	35.9	Feb.	31.4
Mar.	30.6	Mar.	34.3	Mar.	34.4 M
Apr.	43.7	Apr.	36.5	Apr.	41.1 M
May	56.8	May	52.4	May	47.3 M
June	56.3	June	60.9	June	59.5
July	69.3	July	69.4	July	70.5
Aug.	71.2	Aug.	71.1	Aug.	71.5
Sept.	63.5	Sept.	55.6	Sept.	56.3 M
Oct.	42.2	Oct.	45.5	Oct.	44.2 M
Nov.	36.6	Nov.	38.0 M	Nov.	32.5 M
Dec.	30.4	Dec.	26.4	Dec.	22.1
Annual	46.6	Annual	46.3	Annual	45.0 M

M = Data incomplete.

Source: Published records of U.S. Weather Bureau

Table 2-14 Monthly Temperature (°F) for Beowawe, Nevada, 1969-1971

1969		1970		1971	
Month	Temperature	Month	Temperature	Month	Temperature
Jan.	32.3	Jan.	M	Jan.	30.9
Feb.	29.5	Feb.	29.4 M	Feb.	34.9
Mar.	35.5	Mar.	36.3 M	Mar.	39.4
Apr.	48.8	Apr.	39.6 M	Apr.	46.6
May	61.3	May	57.1 M	May	53.4
June	63.2	June	64.0 M	June	62.4
July	74.2	July	74.1	July	74.7
Aug.	72.9	Aug.	M	Aug.	75.9
Sept.	64.0 M	Sept.	57.2 M	Sept.	57.2
Oct.	46.9 M	Oct.	44.6	Oct.	46.3
Nov.	M	Nov.	40.3	Nov.	37.2
Dec.	M	Dec.	27.3	Dec.	24.3
Annual	-----	Annual	-----	Annual	48.6 M

M = Data incomplete. ----- = No data.

Source: Published records of U.S. Weather Bureau

Table 2-15 Freeze Data for Eureka, Nevada, (Period of Record, 1953-1959)

Number of Days Between the Last Spring Minimum and the First Fall Minimum			
Year	(growing season) 32° F or below	28° F or below	24° F or below
1953	111	128	129
1954	96	115	150
1955	108	117	143
1956	109	109	133
1957	95	96	96
1958	93	134	140
1959	27	112	131
Average for 1953-59	91	116	132

Source: U.S. Weather Bureau

Table 2-16 Diamond Valley Temperature Maximums/Minimums, 1976-1982, as Interpretated From Appendix 3-A Data

Month		1982		1981		1980		1979		1978[1]/		1977[1]/		1976	
		°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
January	Max.	51	10.5	60	15.5	55	12.7	46	7.7	39.4	4.1	39.2	4.0	54	12.
	Min.	-36	-37.7	1	-17.2	-24	-31.1	-26	-32.2	18.2	-7.6	6.5	-14.1	-10	-23.
February	Max.	59	15.0	63	17.2	65	18.3	55	12.7	42.3	5.7	50.1	10.0	55	12.
	Min.	-37	-38.3	-1	-18.3	-3	-19.4	-13	-25.0	23.3	-4.83	13.4	-10.3	-8	-22.
March	Max.	60	15.5	64	17.7	61	16.1	64	17.7	55.4	30.8	43.9	6.6	63	17.
	Min.	4	-15.5	11	-11.6	7	-13.9	16	-8.9	30.6	-0.7	16.4	-8.6	5	-15.
April	Max.	78	25.5	82	27.7	76	24.4	72	22.2	55.1	12.7	62.6	17.0	71	21.
	Min.	-3	-19.4	14	-10.0	10	-23.3	7	-13.9	29.6		26.9		10	
May	Max.	75	23.8	76	24.4	77	25.0	88	31.1	65.7	18.7	57.4	14.1	84	28.
	Min.	17	-8.3	15	-9.4	23	-5.0	25	-3.9	32.8	0.4	31.9	-0.5	27	-2.
June	Max.	87	30.5	93	33.9	87	30.5	93	33.9	77.4	25.2	80.4	26.9	90	32.
	Min.	23	-5.0	17	-8.3	21	-6.1	27	-2.7	38.5	3.6	44.1	6.7	20	-6.
July	Max.	90	32.2	96	35.5	92	33.3	95	3.5	86.1	30.0	84.2	29.0	93	33.
	Min.	32	0.0	35	1.6	37	2.7	38	3.3	45.6	7.5	48.1	8.9	34	1.
August	Max.	93	33.9	98	36.6	90	32.2	95	3.5	83.9	28.8	81.3	27.4	86	30.
	Min.	37	2.7	34	1.1	33	0.5	33	0.5	43.5	6.5	47.6	8.6	35	1.
September	Max.	90	32.2	90	32.2	89	31.6	86	30.0	70.6	21.4	73.6	23.1	90	32.
	Min.	25	-3.9	25	-3.9	22	-5.5	28	-2.2	35.0	-1.6	38.7	3.7	31	-0.
October	Max.	69	20.5	73	22.7	93	33.9	80	26.6	67.0	19.4	68.1	20.0	76	24.
	Min.	9	-12.7	16	-8.9	8	-13.3	16	-8.9	23.7	-4.6	29.3	-1.5	11	-11.
November	Max.	61	16.1	67	19.4	75	23.8	61	16.1	44.5	6.9	52.1	11.1	72	22.
	Min.	3	-16.1	2	-16.6	-10	23.3	-2	-18.8	18.8	-7.3	22.7	-5.1	-4	-20.
December	Max.	59	15.0	62	16.6	56	13.3	61	16.1	39.3	4.0	44.7	7.0	55	12.
	Min.	-8	-22.2	0	0.0	1	-17.2	-8	-22.2	7.9	-13.4	21.1	-6.0	-8	-22.

[1]/ Average of maximums and of minimums.

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Table 2-17 Diamond Valley Frost Dates, 1967-1982, as Interpretated From Appendix 3-A Data

Year	Last[1]	First[1]	Frost Free Days[2]
1967	June 3	September 13	101
1968	June 30	September 4	66
1969	May 28	August 29	93
1970	June 30	September 13	75
1975	June 23	September 8	68
1976	June -	September -	ND
1977	May -	October -	ND
1978	May -	September -	ND
1979	June -	September -	ND
1980	June -	September -	ND
1981	June -	September -	ND
1982	July -	October -	ND

---

[1] Record of data 1976 - 1982 received does not indicate frost date. See Appendix 3-A.

[2] Estimated from Max/Min temperature dates that were recorded as "end of week". See Appendix 3-A. Early June to early September frost free 83.75 (90) days.

valley floor than in Eureka, which is 500 to 600 feet higher (SCS, 1980). Daily high temperatures, however, are similar at the two locations because of air mixing produced by surface heating (SCS, 1980).

2.2.3 Thermal Inversion

Many of the valleys in Nevada commonly experience thermal inversions, otherwise referred to as low level temperature inversions. These inversions occur about 45 percent of the time in central and eastern Nevada (SCS, 1980). Diamond Valley experiences inversions regularly and can be expected to uphold the same percent frequency previously stated. Inversions occur when surface air around the mountain slopes, cooled by radiation loss, drains down the mountain slopes at night and into the valley. This brings about the temperature inversion, in which the normal temperature decrease with height is reversed. The volume of air, if sufficient, can fill an entire valley if it is not too broad (Conger, 1974). This type of drainage usually occurs all night on cold winter nights. After sunrise, thermal upslope flow may set in on slopes exposed to the sun. However, cold layers which have accumulated from inversion may become so deeply entrenched that they remain undisturbed during the short winter days (Conger, 1974). Only a brisk wind may be capable of clearing out the valleys. It can be seen that the inversions during the winter season contribute to air pollution, since most of the air and impurities lie stagnant over the area.

2.2.4 Humidity

Humidity within the region is usually low, especially in the valleys, and averages about 30 percent in summer. Humidity can reach 20 percent in the summer during the day and 40 percent to 45 percent at night. Humidity in winter averages 65 percent (SCS, 1980).

2.2.5 Evaporation

The two principle means by which water is lost in the area are evaporation of shallow groundwater and transpiration from plants called phreatophytes. Surface water evaporation estimates range from 3.5 to 5 feet. (1.07 m - 1.52 m) per year (HDR, 1980b). Transpiration is estimated at 1.2 inches (3.05 cm)

for scattered vegetation and up to 18 inches (45.7 cm) for wetlands and springs (HDR, 1980b).

Average percentage of possible sunshine is about 80% (Houghton et al, 1975). Since sunshine is abundant, lake evaporation is high, averaging slightly more than 45 in per year (114.3 cm) (SCS, 1980). Water ponding on the playas rapidly evaporates.

2.2.6 Growing Season/Freeze Free Season

The growing season is relatively short, with areas of lower altitude often having an even shorter average growing season due to thermal inversions. Diamond Valley experiences inversions about 45 percent of the time (SCS, 1980). The effect of this phenomenon is that the growing season (base 32°F) is considerably shorter on the valley floor, 70 to 100 days, with the shortest period in the center and lowest parts of the valley (SCS, 1980). The growing season at Eureka averages 100 days with a range of from 47 to 147 days during the period of record, 1902 through 1930. Table 2-15 presents freeze data and growing season data for Eureka.

2.2.7 Dust Storms

The arid climate, dry soils and occasional strong winds of the area contribute to dust storms. Concentrations of the natural windblown dust may reach such levels as to severely reduce visibility and be mixed into the upper atmosphere. Table 2-18 shows some dust observation data for eastern Nevada.

2.2.8 Flooding

Three types of floods occur in the Great Basin area: snowmelt, rain-on-snow and thunderstorms (HDR, 1980). Snowmelt floods occur from April through June, rain-on-snow generally occurs November through March, and thunderstorms occur principally during the summer and fall months. Generally, the maximum annual and most frequent type of flood in the project study area is caused by thunderstorm activity (HDR, 1980b).

Table 2-18 Monthly Percent Frequency of Dust Observation in Elko and Ely, Nevada

	Percentage of Hourly Weather Observations with Recorded Dust Observations											
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Elko, NV	0.055	0	0.055	0.229	0.174	0.016	0.320	0	0.025	0.103	0	0.061
Ely, NV	0.036	0.038	0.053	0.254	0.018	0.018	0.530	0	0.019	0.055	0.19	0.081

ANNUAL - Elko, 0.061
Ely, 0.054

Source: HDR, 1980a. M-X ETR No. 13.

Although thunderstorms may occur on many days in one season and be spread over a large area, the high intensity rainfall is limited to small areas. Indications are that as much as 7 in (17.8 cm) of rain may fall in less than one hour (HDR, 1980b). It is this high intensity, usually occurring in less than one square mile, which produces floods and sometimes mud-rock flows.

2.2.9 Stability

Nevada experiences the occurrence of frequent atmospheric stability, as shown in Table 2-19. Although stability varies seasonally and diurnally in the region, the cold air drainage into the valleys and the extreme amount of evening radiational cooling enhances stability (HDR, 1980a).

This is because the surfaced based inversions restricts turbulent diffusive spreading. Thus, the night hours are marked by suppressed turbulence and the flow in the valley is comparatively undisturbed. In addition, the cold layers that often accumulate at night due to the inversion may become so entrenched in the valley that they are not broken up during short winter days.

2.2.10 Winds and Mixing Heights

Winds. Prevailing westerly winds are typical. Surface wind direction and speed is greatly influenced by local topography and strong diurnal heating and cooling. The mountain ranges create a tendency for the lower level winds to "follow" the valley topography. Because of this, winds in the valleys are predominantly southerly or northerly with some variation. For instance, during winter and spring, wind direction is often southeast to south-southwest, generally following the valleys with variation due to the orientation of each storm. With the approach and passing of an eastward moving front, a gradual progression around to westerly takes place, rather than a definite shift from southerly to west or north, but with alternate backing and veering of from 30° to 90° as successive squalls pass through the area (Strojie, 1968).

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Table 2-19 Average Range of Frequency of Stability Conditions in Nevada

Season	Percent Frequency of Stability Conditions Nevada Stable	 Neutral	 Unstable
Winter	30-40	45-55	5-15
Spring	25-35	40-50	15-25
Summer	30-40	30-40	25-35
Autumn	40-50	30-40	20-30
Annual	30-40	35-45	20-30

Source: HDR, 1980a. M-X ETR No. 13.

During the evening, wind patterns shift as cold dense air descends from the higher elevations into the valleys, creating downslope winds. In the morning, the heating of eastern mountain slopes (due to orientation to the rising sun) induces upslope winds. The upslope winds are usually dominated by winds blowing up and down the valley as the day progresses and the entire valley is heated (Strojie, 1968).

The general ability of atmospheric mixing in the area is good. Morning mixing heights are low in Nevada due to the nocturnal radiation inversions and surface-based temperature inversions (HDR, 1980a). Vertical mixing occurs a few hours after sunrise as the inversions disperse, due to surface heating of the valley floors by the sun which in turn causes vertical atmospheric mixing. The mean annual morning mixing height is in the order of 950 feet (290 m) above ground level.

Afternoon mixing heights are considerably greater, especially during the spring through autumn seasons, and wind speeds are relatively brisk. The mean annual afternoon mixing height is in the order of 7,900 feet (2,400 m) above ground level. Table 2-20 shows representative mixing heights and wind speeds in Nevada.

Mixing heights and wind conditions similar to that described above exist in Diamond Valley. The wind can blow from all directions, particularly during storm events. Average wind velocity is estimated to be less than 20 miles per hour (SCS, 1980). Statistics in outlying counties suggest that gusts of 70 miles per hour can be expected, on an average, once in 50 years (SCS, 1980). Surface winds are strongest when associated with passing storms, but valley winds can also reach high speeds (SCS, 1980).

2.3 Climate of Mt. Hope and Immediate Vicinity

The climate for Mt. Hope is similar to that discussed in the previous sections, with some variations, which are summarized below.

Mt. Hope receives between 10 to 15 in (25 to 38 cm) of rain annually. Most snow occurs between December and March with mean annual snowfall averaging

Table 2-20 Mixing Heights and Wind Speeds for Stations in Nevada

		Winter		Spring		Summer		Autumn		Annual	
Station	Time	HT 1/	WS 2/	HT	WS	HT	WS	HT	WS	HT	WS
Ely, NV.	Morning	633	11.4	1604	11.4	357	9.4	528	10.0	780	10.5
	Afternoon	3516	12.3	8882	16.5	11887	15.6	7147	13.6	7858	14.5
Las Vegas, NV.	Morning	1052	10.0	1420	12.5	958	10.5	905	9.6	1084	10.7
	Afternoon	3782	9.4	9135	15.9	12113	15.0	6908	11.6	7984	13.0
Winnemucca, NV.	Morning	987	7.4	1423	9.2	423	6.0	836	7.6	917	7.6
	Afternoon	3500	11.0	9040	15.2	11992	13.9	7052	12.0	7896	13.0

1/ HT = Height (ft.)

2/ WS = Wind Speed (mph)

Source: SCS 1980

from 10 to 40 in (25 to 102 cm). Temperature range is from 65° to 75°F (18° to 24°C) in July to 20° to 30°F (-7° to -1°C) in winter. Frost generally occurs from September through June.

The 100-year, 6-hour and 24-hour storm events were used at Mt. Hope as design precipitation events. The precipitation at Mt. Hope during these flood events was estimated at 1.9 inches (4.8 cm) and 2.8 inches (7.1 cm), respectively (Miller, et al, 1973).

2.4 Air Quality of Mt. Hope and Immediate Vicinity

Air quality data specific to the project site is not available in the historic record. The information presented herein represents a complete reporting on the area. As derived from discussions with NDEP Air Quality Section personnel and various literature based data on meteorology and air quality from Eureka, Diamond Valley, Beowawe, Elko and Ely; the nearest locations to Mt. Hope for which monitoring data exist.

Air quality conditions in Eureka County reflect that which might be expected in consideration of the area's topographic, vegetative, demographic and industrial characteristics. Specifically; major industrial sources of criteria pollutant emissions do not exist in Eureka County; topographic relief represents a major factor influencing atmospheric stabilities; vegetative types (representative of a semi-arid climate and dry soils) limit natural wind erosion controls and, a rural population of relatively low density limits significant or major man-induced air quality impact.

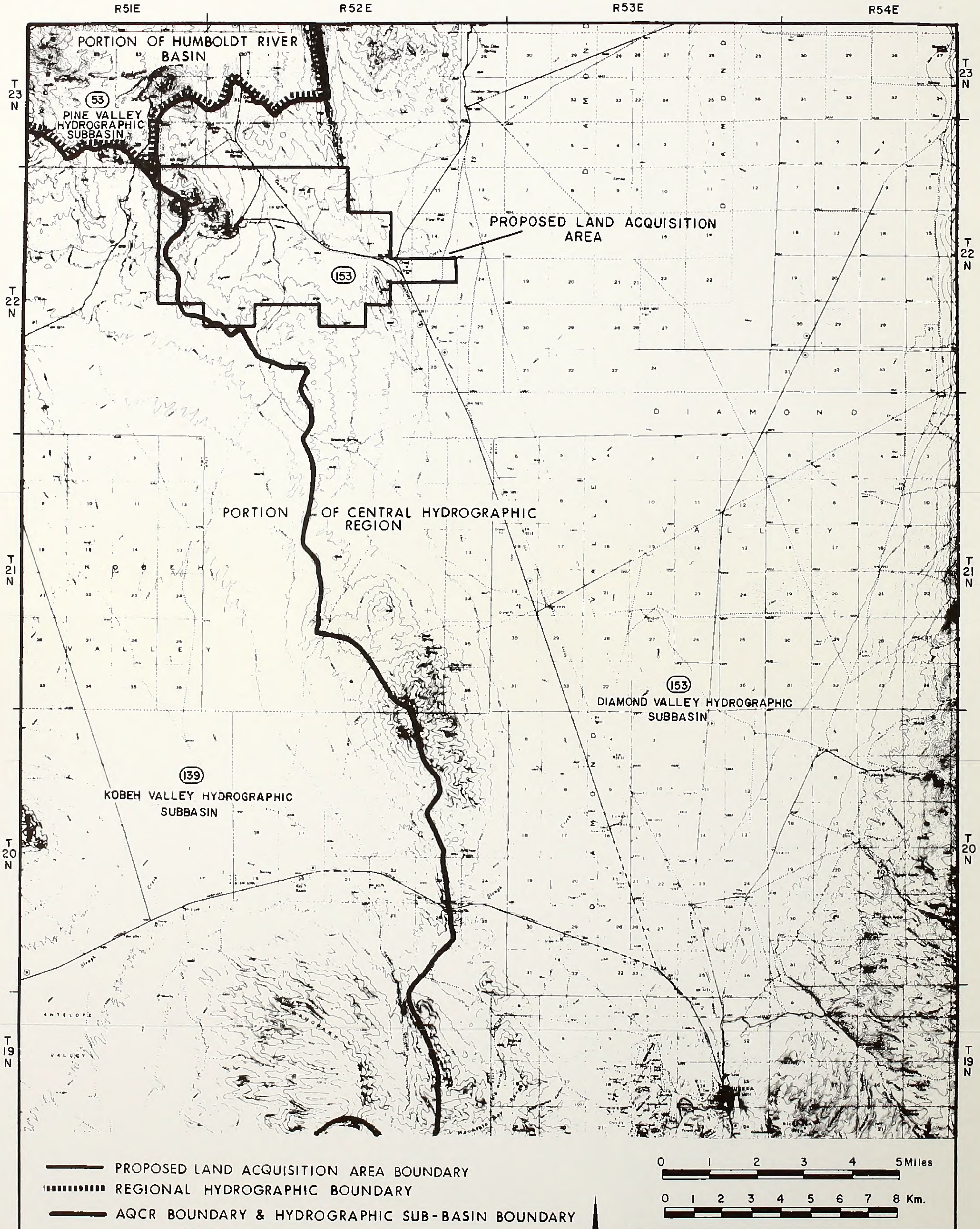
Excepting dust storm excursions, the overall air quality of Eureka County and Eureka Township may be characterized as excellent. The county is designated as an NAAQS (National Ambient Air Quality Standards) attainment Class II area for all criteria pollutants: total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), nitrous oxides (NO_x), hydrocarbons (HC), lead (Pb) and ozone (O_3) (G. McCleary, NDEP, personal communication, 1983). Although ambient air quality measurements are not presently made in Eureka County it is reasonable to assume by virtue of the lack of anthropogenic sources and from measurements made at similar latitudes elsewhere in the United

States, that the existing ambient levels in Eureka County would be comparable to the background levels established for rural areas in the United States. Suspended particulate matter would be expected to register variable concentrations dependent on temporal conditions of wind speed, humidity, precipitation occurrence and extent of any land surface disturbance activity (e.g., construction, dirt road travel, etc.). Population centers such as the Town of Eureka may be expected to frequently and/or normally register pollutant concentrations of TSP, NO_x and CO above non-detectable limits but substantially lower than established NAAQS limits.

On a regulatory basis, the air quality of Nevada's three Air Quality Control Regions (AQCR 013, 147, 148) is characterized in detail by individual hydrographic sub-basin boundaries. Developments potentially affecting existing baseline conditions are evaluated by the Air Quality Section of the Nevada Division of Environmental Protection (NDEP). The Mt. Hope area is located in AQCR 147 including parts of Diamond Valley hydrographic sub-basin (No. 153) and the extreme northern boundary of Kobeh Valley Hydrographic sub-basin (No. 139). The extreme southern portion of the Pine Valley hydrographic sub-basin (No. 53) is adjacent to the proposed site boundary. Figure 2-1 illustrates the AQCRs by hydrographic basin.

Historically, less than 15 tons of particulate matter in the three hydrographic sub-basins are produced by stationary and mobile industrial sources. Diamond Valley source contributions, mostly agriculture related, account for approximately 50 to 65 percent of the total anthropogenic regional amounts recorded (HDR, 1980).

Indicative of the area's natural influence upon air quality is the historical ratio of natural particulate generation to human-related source contribution which is nearly 6 to 1 (20,200 tons to 3,500 tons in 1977) (HDR, 1980). Diamond Valley source contributions of particulate matter total approximately 11,000 tons, of which 9,500 tons are characterized as natural fugitive dust (HDR, 1980). Sources of natural contribution may be attributed to lack of significant vegetative cover, low seasonal precipitation during summer, wind storm occurrences and generally unconsolidated soils in natural areas (G. McCleary, NDEP, personal communication, 1983). Anthropogenic source


R51E
R52E
R53E
R54E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
PORTION OF HUMBOLDT RIVER BASIN
53
PINE VALLEY HYDROGRAPHIC SUBBASIN
PROPOSED LAND ACQUISITION AREA
153
PORTION OF CENTRAL HYDROGRAPHIC REGION
DIAMOND
VALLEY
KOBEH VALLEY
153
DIAMOND VALLEY HYDROGRAPHIC SUBBASIN
139
KOBEH VALLEY HYDROGRAPHIC SUBBASIN
ANTELOPE VALLEY
PROPOSED LAND ACQUISITION AREA BOUNDARY
REGIONAL HYDROGRAPHIC BOUNDARY
AQCR BOUNDARY & HYDROGRAPHIC SUB-BASIN BOUNDARY
HYDROGRAPHIC SUB-BASINS
53 PINE VALLEY
139 KOBEH VALLEY
153 DIAMOND VALLEY
Nevada
MAP AREA
N
0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Km.

BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY, WHISTLER MTN., DIAMOND SPRINGS & EUREKA, NEVADA.

MT. HOPE MOLYBDENUM PROJECT

AIR QUALITY CONTROL REGIONS AND HYDROGRAPHIC BASINS

U.S. Department of the Interior
Bureau of Land Management

FIGURE 2-1

contribution may be largely attributed to agricultural purpose surface land disturbance. For regulatory and impact assessment purposes, the NDEP applies a regional average of 25 micrograms (ugm)/cubic meter as a TSP concentration throughout the area (G. McCleary, NDEP, personal communication, 1983).

No Class I (pristine) areas are designated within Eureka County. The State of Nevada has only one such area located distantly near the northeastern border adjoining Idaho State (Jarbridge Wilderness Area, Humboldt County). The nearest nonattainment zone is located approximately 100 miles northeast of the project area near Battle Mountain hydrographic sub-basins Nos. 59 and 65. The Roberts Wilderness Study Area approximately 5.6 miles west-northwest of the project area may, upon official wilderness designation, be considered by the State for possible designation as a Class I air quality control area.

CHAPTER 3.0

IMPACT ANALYSES

3.1 Introduction

The analysis of potential impacts to the air quality of the project region was conducted principally to evaluate the expected levels of project generated pollutants in relation to all applicable air quality standards and regulations. The studies concentrated on aspects of air quality rather than on meteorology and climatology, as the scale of the latter two is intrinsically too large to be measurably impacted by the proposed project. Analyses were based on emissions levels reduced by best available control technology (BACT), where feasible. Comprehensive coverage of air quality issues was provided by addressing combined pollutant point source emissions in an appropriate computerized modeling effort, as well as by fugitive dust impacts evaluation and by analysis of potential visibility impairment. Additionally, the issue of potential impacts to soil chemistry was evaluated.

Alternatives to the proposed mine plan would in some cases possibly cause significant change to some parameters and levels of emissions, and are discussed in the text under results.

3.2 Assumptions and Analysis Guildelines

The determination of environmental impacts upon the air quality resources bases required that certain assumptions be made which would affect conclusions regarding significance of impact and nature of impact (beneficial/ detrimental). The general assumptions used in the analyses are presented below.

1.) It was assumed that the proposed action and alternatives described briefly in Chapter 1.0 of this Technical Report and in detail in Chapter 2.0 of the EIS and Technical Report No.1 would be implemented as described and that associated atmospheric emissions would be as characterized in Section 3.2.1, Detailed Basis of Emissions Source Inventory. Mitigation measures described in the EIS would be in place at time designated and

as described. Assumptions 2 through 10 below highlight particularly important aspects of the proposed action and alternatives described, as related to air quality resources.

2.) The proposed action would result in the disturbances of the following acreages of land:

	Temporary
Mine Pit	700 acres
Non-Mineralized Material Storage Areas (2)	2,400 acres
Tailings Pond 4-A	3,460 acres
Evaporation Pond	164 acres
Plant Site and Auxiliaries (See Section 3.2.1)	100 acres
Site Access Road	30 acres
Power Line 2-A (3.5 acres/mile)	77 acres
Water Line	132 acres
State Route Relocation	67 acres

Approximately 200 acres would be impacted by the proposed development of an employee subdivision. The impacts associated with the subdivision development relative to air quality resource effects were not evaluated as to specific geographic location because of the uncertainty of eventual subdivision siting location. Generalized impacts were evaluated.

The alternatives (excepting the no action alternative) would, upon implementation, result in the alternate disturbance of the following acreages of land.

Power Line 2-B	73.5 acres
Power Line 2-C	80.5 acres
Power Line 3-B	108 acres
Power Line 3-C	96 acres
Trailings Pond 4-B	5,650 acres
Trailings Pond 4-C	2,173 acres

3.) Of the areas undergoing initial project activity disturbance, contemporaneous reclamation would occur only along rights-of-way corridors and within the areas of the process plant site between corridors. Remaining areas would not be reclaimed until cessation of ore removal operations. Upon cessation of mining, the mine pit and non-mineralized material storage areas would not be reclaimed, all other areas would be reclaimed. This assumption was particularly important to the evaluation of fugitive dust emissions.

Of the areas undergoing contemporaneous reclamation, the following operational acreage disturbances would occur through mine life (or be permanent if roads, power lines and water lines are left intact for other use).

Proposed Action	Initial Acres	Contemporaneous Acres
Power Line 2-A	77	40
Power Line 3-A	132	42
Alternatives		
Power Line 2-B	73.5	38
Power Line 2-C	80.5	41
Power Line 3-B	108	34
Water Line 3-C	96	25

4.) Reclamation after construction (rights-of-way corridors and interplant acres) would consist of stockpiled topsoil redistribution, regrading and revegetation of a ground cover as soon as possible after the construction activity was completed. Construction periods would be 11 weeks for power line; 12 to 16.5 weeks for water line; and up to two years for process plant components.

5.) Topsoil and overburden would be removed and stockpiled from primarily the tailings pond site area and non-mineralized material storage areas. If the topsoil stockpiles were to exist for more than one year, they would be seeded for stabilization.

6.) Final reclamation would primarily entail, in part, the following, as determined by regulations existing to date.

Mine/Non-Mineralized Material Storage Areas. The open pit mine would remain as it would exist at the end of mining. Because the non-mineralized material storage areas would be composed of large rocks, they would not be recontoured or reclaimed.

Process Plant. The process plant and other capital facilities would be salvaged as much as possible. Unsalvageable portions would be demolished and disposed of either offsite or in the landfill. The surface would be cleaned, graded as necessary, and revegetated.

Tailings Pond. After the tailings pond surface has dried out, approximately two feet of rock from the non-mineralized material storage areas would be placed over the tailings. As much as possible, this rock layer would then be covered with the overburden/topsoil stockpiled during construction. The cover would then be seeded and pinyon and/or juniper trees would be planted.

The slope of the final cover surface would be graded appropriately, and the downstream face of the tailings pond dam would be recontoured to the extent necessary to maintain stability and control erosion during the tailings basin dry-out period.

7.) Activity during construction along rights-of-way corridors would be conducted under conditions in part set forth to control fugitive dust, as BLM reclamation/revegetation guidelines.

Most particularly, the following:

- Clearing of the disturbed area would be kept to the least amount possible. Vegetation cover would not be removed from any area unless necessary for construction and approved by BLM.
- All construction access would be reviewed and approved prior to

construction with existing roads and trail used wherever possible. All travel would be limited to specified overland routes unless existing roads and trails are available for use. Natural grass and low brush would not be routinely removed.

- Public land areas used for temporary access roads, equipment storage, and other construction activities would be restored to their natural state insofar as practicable and in accordance with a restoration plan approved by BLM.

- Revegetation would be required in areas identified by BLM on the date specified.

- Reasonable means would be used to minimize erosion and soil damage in connection with any construction, rehabilitation, or maintenance operations.

- Any ruts, depressions, of other such disturbances caused by construction would be restored.

9.) For impact assessment purposes, it was assumed that essentially all of the 10,000 acre Mt. Hope area would be disturbed during the life of the project. "Disturbance" has been defined for analytical purposes as "effective area of disturbance" and does not necessarily connote actual physical disturbance.

10.) For impact assessment purposes, it has also been assumed that the emission controls described in Section 3.2.1 would be implemented as proposed, assuming that regulatory requirements are, at a minimum, as specified to date (most importantly Prevention of Significant Deterioration permitting requirements (e.g. use of Best Available Control Technology, air quality monitoring, etc.) and the necessity to assure compliance with National Ambient Air Quality Standards (NAAQS)).

Several specific assumptions used in the evaluation of potential atmospheric resource impacts are discussed in each of the following

sections. Section 3.2.1 specifically reviews the basis of emissions inventory utilized to characterize the potential for air quality impacts resultant of proposed action and/or alternatives implementation.

3.2.1 Detailed Basis of Emissions Source Inventory

The molybdenum process plant component of the proposed action (and alternatives) would represent the primary source of emitted air pollutants regulated by law. Construction and operation of the mining component; i.e., mine pit excavation, ore hauling and crushing, and storage would represent the primary "active" source of fugitive dust emissions. Wind or aeolian soil erosion from the proposed or alternative tailings pond areas would represent the primary "passive" source of fugitive dust emissions.

In order that a comprehensive and accurate assessment of potential for air quality degradation be conducted, a thorough compilation of emission source data was required. This section presents, in the manner of a summary, the listing of emission causative factors (e.g., vehicle travel at 25 m.p.h. on dirt road; hydrometallurgical process plant emissions) and the individual source emissions as calculated.

It should be noted that the calculation of atmospheric pollutants required quantitative information provided by EXXON, particularly in the characterization of mineral processing emissions. The process plant emissions so provided by EXXON were reported as being based on a review of existing facilities similar in type to that proposed, a review of industry and EPA research pertaining to such emissions, and on the analysis of EXXON's engineering plans prepared specifically for the Mt. Hope project. Emissions of vehicular traffic, rights-of-way construction, and of aeolian source were calculated by the WRC EIS Team members with limited input (e.g., number of trucks used, tailings pond slope, rock sizing at nonmineralized material storage areas, etc.).

The following presents a substantial amount of emissions data reported in Technical Report No.1, Project Description. The data presented in Technical Report No.1 is accompanied by text discussion detailing process

flow, chemicals utilized, etc. that has only been briefly presented in the following. A review to attain an emission source understanding should include reading of Technical Report No.1

3.2.1.1 Emissions Associated with Rights-of-Way Construction and Mine Area Stripping/Operation

As noted in Assumption 2, the proposed action and alternatives would require the construction along a power line right-of-way, a water line right-of-way and a state route relocation right-of-way. Such construction would require the utilization of significant amounts of equipment, fueled by both gasoline and diesel gas, which would result in the short-term emission of gaseous and particulate pollutants. Additionally, the overburden stripping of mine areas (i.e. mine pit, non-mineralized material storage areas, plant site, and tailings pond area) would require the use of equipment similarly disposed to pollutant emissions. Such emissions are considered mobile source emissions, as opposed to stationary sources as in the case of the process plant, and are not generally regulated. Due to the extent of the proposed action, however, mobile emissions have been characterized to allow a review of potential, if any, for significant long-term impacts.

Tables 3-1 through 3-6 alternately list equipment in use and associated atmospheric emissions by type of project activity (e.g., Tables 3-1 and 3-2 specify power line construction equipment and associated atmospheric emissions, respectively). Tables 3-7 through 3-13 detail the equipment necessary to prestrip mine and process plant areas and the atmospheric emissions anticipated during operation of the mine pit/nonmineralized material storage areas and during construction of the process plant.

The atmospheric loadings indicated were calculated from emission factors specified in EPA AP-42 (Tables 3.1.2-1, 3.1.2-8, 3.1.3-1, 3.1.4-1, 3.1.4-4 and 3.1.5-1). The emission factors utilized were:

Table 3-1 Equipment Utilized During Construction of Power Line and Access Road

Type [1]	Horsepower (hp)	Kilowatt (kw)	No.
Cars (G)	200	150	3
Pickup Trucks (1/2 Ton) (G)	200	150	6
Office Trailer	--	-	1
Bulldozer (D)	270	200	2
Road Grader (D)	325	240	1
4/4 Pickup Trucks (G)	200	150	6
Truck/Tractor with Auger (D)	300	225	2
Air Compressor (D)	97	73	4
Backhoe (D)	195	145	2
6x6 Flat Bed Trucks (D)	185	140	2
Fuel Lube Trucks (D)	200	150	2
25-Ton Crane (D)	210	155	1
Pole Trailer	--	-	3
Wire Trailer	--	-	3
Reel Stands	--	-	15
Fork Lift	--	-	1
Conductor/Static Line Tensioners	--	-	2
Traveler Truck with 6-Ton Boom (D)	493	365	1
Conductor Travelers	--	-	300
6x6 with Aerial Platform (G)	220	165	3
4x4 6-man Carry-Alls (G)	200	150	6

[1] G = gasoline-fueled, D = diesel-fueled

Source: EXXON Minerals Company and Mt. Wheeler Power Company

Table 3-2 Environmental Loadings Associated with Construction of Proposed Action and Alternative Power Lines

	Proposed Action	Alternative 2-B	Alternative 2-C
Length (miles)	22	21	23
Area Disturbed (acres)	77	73.5	80.5
Permanent Acreage Disturbed	40	38	41
Disturbance Period (weeks)	11	10.5	11.5
Employee Months (total)	206	197	215
Air Emissions			
- Sulphur Oxides (SO_x)(lbs/day)	14.5	14.5	14.5
- Nitrous Oxides (NO_x)(lbs/day)	195.5	195.5	195.5
- Total Suspended Particulates (lbs/day)	14.1	14.1	14.1

SOURCE: EXXON Minerals Company, Mt. Wheeler Power Company, WRC EIS Team

Table 3-3 Equipment Required for Construction of Water Supply Pipeline and Access Roads

Type [1]	Horsepower (hp)	Kilowatt (kw)	No.
Motor Grader (D)	195	145	1
Dump Trucks (D)	250	185	5
Bulldozer (D)	410	305	1
Scraper	--	--	1
Sheepsfoot Compacter	--	--	1
Backhoe (D)	195	145	1
Backhoe (D)	62	46	1
Water Truck (3000-gal) (D)	200	150	1
Pick-up Trucks (G)	200	150	2

[1] G = gasoline-fueled, D = diesel-fueled

Source: EXXON Minerals Company

Table 3-4 Environmental Loadings Associated with Construction of Proposed Action and Alternative Water Lines from Kobeh Valley

	Proposed Action	Alternative 3-B	Alternative 3-C
Road/Pipeline Length (miles)	11	9	8
Area Disturbed (acres)	132	108	96
Permanent Disturbance Area (acres)	42	34	25
Duration of Disturbance (weeks)	16.5	13.5	12
Employee Months (total)	21.7	17.7	15.8
Air Emissions			
- Sulphur Oxides (SO_x)(lbs/day)	9.9	9.9	9.9
- Nitrous Oxides (NO_x)(lbs/day)	134.0	134.0	134.0
- Total Suspended Particulates (lbs/day)	5.7	5.7	5.7

SOURCE: EXXON Minerals Company and WRC EIS Team

Table 3-5 Equipment Utilized During State Highway Relocation Construction Phase

Type [1]	Horsepower (hp)	Kilowatt (kW)	Number
Dozers D-8	300	225	2
Scrapers 631	450	335	5
Backhoe (1 Cu. Yd.)	55	40	1
Loaders 966	200	150	2
Rollers (Pneum.)	100	75	2
Rollers (Steel)	87	65	2
Trucks (Hauling)	200	150	10
Trucks (Water)	150	110	2
Motor Grader 135	180	135	2
Crushing Plant	300	225	1
Hot Plant	100	75	1
Paver	122	90	1

---

[1] All equipment is diesel fueled.

Source: Nevada Department of Transportation

Table 3-6 Environmental Loadings Associated with Construction of State Route Relocation

Total Length (miles)	6
Area Disturbed (acres)	67
Duration of Disturbance (months)	8
Employee Months 1/	400
Air Emissions	
- Sulphur Oxides (SO_x)(lbs/day)	21.8
- Nitrous Oxides (NO_x)(lbs/day)	283.2
- Total Suspended Particulates (lbs/day)	11.9

1/ Based on a work crew of 50 persons.

SOURCE: EXXON Minerals Company, Nevada Department of Transportation and WRC EIS Team

Table 3-7 Rate of Areal Disturbance During Pit Development and Non-Mineralized Material Storage Area (acres) (km^2)

Year	Pit		Storage Area		Total	
5	173	(0.7)	857	(3.5)	1,030	(4.2)
10	193	(0.8)	1,598	(5.7)	1,791	(6.5)
50+	695	(2.8)	2,745	(11.2)	3,440	(14.0)

Source: EXXON Minerals Company

Table 3-8 Representative Equipment In Operation During Pre-Production Stripping (Construction)

Item[1]	Horsepower (hp)	(Kilowatt) (kW)	Available Units	Units used During a Work Period
DRILLING				
12-in. Drill	500	(370)	2	1
Secondary Drill	300	(225)	2	1
BLASTING				
Explosive Truck	200	(150)	2	1
Blast Hole Stemmer	125	(95)	2	1
LOADING				
15-yd Shovel (E)	--	--	3	2
10-1/2-yd Hydraulic Shovel	400	(300)	2	1
8-yd Front End Loader	375	(280)	2	1
HAULING				
120-ton truck	1,200	(895)	19	15
50-ton truck	650	(485)	2	1
AUXILIARY				
Track Dozer (D-9)	400	(300)	4	2
Rubber Tired Dozer	400	(300)	4	3
Motor Grader	250	(185)	3	2
Water Truck	450	(335)	2	1
Lube Truck (G)	200	(150)	2	1
Fuel Truck (G)	200	(150)	2	1
Welding Truck (G)	200	(150)	2	1
Repair Truck (G)	200	(150)	2	1
Cable Reel Truck (G)	200	(150)	2	1
Backhoe	200	(150)	2	1
60-ton Crane	500	(370)	2	1
20-ton Crane	250	(185)	2	1
Tractor Truck	650	(485)	1	1
Bus (G)	125	(95)	5	4
Pickup 4x2 (G)	125	(95)	15	11
Pickup 4x4 (G)	125	(95)	7	5
Utility Truck (G)	200	(150)	2	1
Mobile Light Plant (G)	10	(7)	7	6

[1] G - Gasoline powered E - Electric powered.
All other equipment diesel-fueled.

Source: EXXON Minerals Company

Table 3-9 Air Emissions (Mobile & Total Suspended Particulates) Associated with Pre-Production Stripping (Construction)[1]

SO_x Emissions		NO_x Emissions		Total Suspended Particulates	
(lbs/day)	(kg/day)	(lbs/day)	(kg/day)	(lbs/day)	(kg/day)
21.8	9.9	291.0	132.0	16.3	7.4

[1] Assumes 70% of the equipment identified in Table 3-8 is in operation at any one time.

Source: EXXON Minerals Company and WRC EIS Team.

Table 3-10 Representative Equipment Required During Pit Operation

Item [1/]	Horsepower (hp)	(Kilowatt) (kW)	Available Units	Units Used During a Work Period
DRILLING				
12-in. Drill	500	(370)	3	2
Secondary Drill	300	(225)	2	1
BLASTING				
Explosive Truck	200	(150)	3	2
Blast Hole Stemmer	125	(95)	2	1
LOADING				
15-yd^3 Shovel (E)	--	--	4	3
10-1/2-yd^3 Hydraulic Shovel	400	(300)	2	1
8-yd Front End Loader	375	(280)	2	1
HAULING				
120-ton Truck	1,200	(895)	25	20
50-ton Truck	650	(485)	2	1
AUXILIARY				
Track Dozer (D-9)	400	(300)	5	3
Rubber Tired Dozer	400	(300)	5	4
Motor Grader	250	(185)	4	3
Water Truck	450	(335)	3	2
Lube Truck (G)	200	(150)	3	2
Fuel Truck (G)	200	(150)	3	2
Welding Truck (G)	200	(150)	3	2
Repair Truck (G)	200	(150)	3	2
Cable Reel Truck (G)	200	(150)	2	2
Backhoe	200	(150)	2	1
60-ton Crane	500	(150)	2	1
20-ton Crane	250	(150)	2	1
Tractor Truck	650	(485)	1	1
Bus (G)	125	(95)	6	5
Pickup 4x2 (G)	125	(95)	20	15
Pickup 4x4 (G)	125	(95)	10	7
Utility Truck (G)	200	(150)	2	1
Mobile Light Plant (G)	10	(7)	10	8

E - Electric-powered G - Gas-fueled. All other pieces of equipment are diesel-fueled.

Source: EXXON Minerals Company

Table 3-11 Air Emissions Associated with Operation of Mine[1]

SO_x Emissions		NO_x Emissions		Total Suspended Particulates	
(lbs/day)	(kg/day)	(lbs/day)	(kg/day)	(lbs/day)	(kg/day)
29.1	13.2	389.1	176.5	22.5	10.2

---

[1] Assumes 70% of the equipment identified in Table 3-10 is in operation at any one time.

Table 3-12 Representative Equipment in Operation During Construction of Process Plant

Item	Horsepower (hp)	(Kilowatt) (kW)	Total Quantity	Units Used During a Work Period
DIESEL-POWERED				
Track drills w/600 CFM compressors	250	(185)	6	4
Dump truck, 19-23 yd^3	450	(335)	4	4
Dump truck, 10-12 yd^3	450	(335)	16	12
Dump truck, 21 yd^3	500	(375)	2	2
Motor grader	250	(185)	4	2
Scraper, 21-31 yd^3	450	(335)	4	3
Dozer	300	(225)	4	2
Dozer	410	(305)	4	2
Front-end loader, 5 yd^3	400	(300)	3	3
Front-end loader, 12 yd^3	800	(600)	1	1
Crane, 150-ton	500	(370)	1	1
Crane, 35-ton	250	(185)	6	4
Crane, 50-ton	250	(185)	4	2
Crane, 30-ton	250	(185)	2	2
Crane, 18-ton	250	(185)	5	4
Crane, 8-ton	250	(185)	3	3
Compactor, 15-ton	250	(185)	2	1
Sheepfoot, Cat 815	250	(185)	2	1
Compactor, 20-ton vibration	250	(185)	1	1
Water truck, 3,000 gal	350	(260)	5	3
Concrete pump, 90 yd^3/hr	150	(110)	2	1
Lowboy trailer, 150-ton w/tractor	400	(300)	1	1
Lowboy trailer, 60-ton w/tractor	300	(225)	3	1
Concrete transit mixer, 8 yd^3	250	(185)	8	6
Aggregate plant, 175 ton/hr	250	(185)	1	1
Concrete plant, 100-m^3/hr	250	(185)	1	1
GASOLINE-POWERED				
Forklift, 1.5-10 ton	150	(110)	6	4
Loader/backhoe	150	(110)	2	1
Backhoe, 1 yd^3	150	(110)	6	4
Sedan	150	(110)	8	8
Pickup	150	(110)	22	22
4-wheel drive	150	(110)	15	10
Van	150	(110)	16	16
Carryall	150	(110)	10	10
Bus	150	(110)	5	5

Source: EXXON Minerals Company

Table 3-13 Air Emissions Associated with Construction of Process Plant[1]

SO_x Emissions (lbs/day)	SO_x Emissions (kg/day)	NO_x Emissions (lbs/day)	NO_x Emissions (kg/day)	Total Suspended Particulates (lbs/day)	Total Suspended Particulates (kg/day)
44.1	20.0	573.2	260.0	35.7	16.2

---

[1] Assumes 70% of equipment in use during a work period (Table 3-12) is in operation at any one time.

	SOx gm/km	NOx gm/km	Particulates gm/km
Heavy Duty Diesel	1.5	21.0	0.75
Heavy Duty Gasoline	0.16	3.0	0.52
Light Duty Diesel	0.39	0.25	0.45
Light Duty Gasoline	0.08	0.19	0.33

Vehicular traffic was assumed at an average of 20 m.p.h. for heavy duty vehicles and 30 m.p.h. for light duty vehicles. Vehicle distance travelled was derived from EXXON estimates detailed in Technical Report No.1 (generally 1-2 miles within the mine pit-process-plant nonmineralized material storage area circuit and as defined by right-of-way distance per day worked.

A sample computation is as follows:

For SO_x contribution shown in Table 3-2 from Heavy Duty Diesel operations listed in Table 3-1.

$$SO_x = 13 \text{ vehicles} \times \frac{1.5 \text{ gm}}{\text{km-vehicle}} \times \frac{256 \text{ km}}{\text{day}} = 4.99 \text{ kg/day}$$

Heavy Duty Gasoline = 0.98 kg/day
Light Duty Diesel = 0.6 kg/day
Light Duty Gasoline = 0.0
TOTAL = 6.57 kg/day or 14.5 lbs/day

3.2.1.2 Emissions Associated with Process Plant Operations

The Mt. Hope process plant would be composed of three parts - concentrator, hydrometallurgical plant and conversion plant. Construction of the process plant facilities is scheduled to occur at the same time as preproduction stripping, i.e., during the first two years of project life. Table 3-12 shows estimates of the numbers and types of equipment that would be operational during this time. Table 3-13 shows the estimated air emissions associated

with construction of the process plant. Land disturbance for the entire plant site area, including auxiliary facilities, would be approximately 100 acres.

If the project goes forward, it is anticipated the process plant would produce in sequence several potentially marketable molybdenum products: molybdenite concentrate, technical grade molybdic oxide (TMO) and ferromolybdenum (FeMo). There are no current plans to recover non-molybdenum by-products for sale. An overall conceptual process flow diagram is shown in Figure 3-1. Process components are discussed in detail in Technical Report No.1.

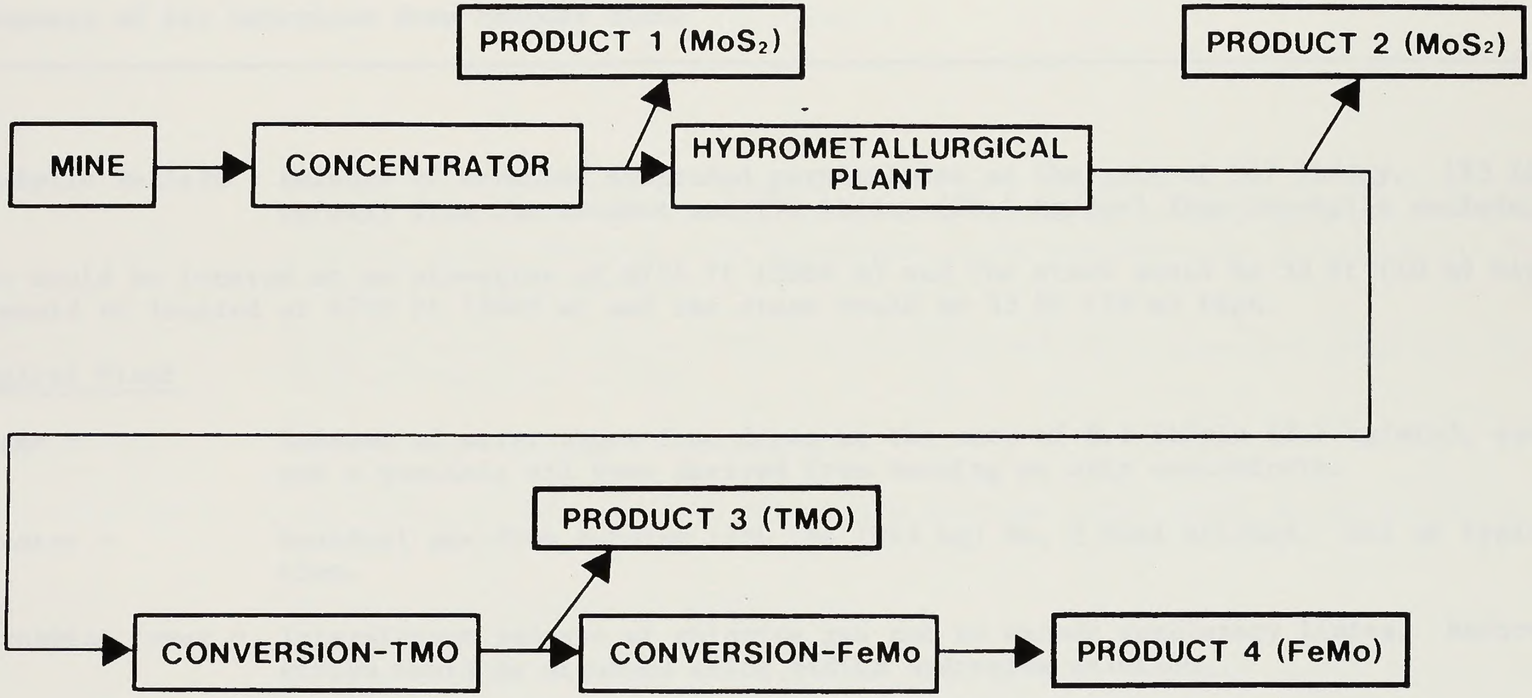
On the basis of process flow design and review of Best Available Control Technology (BACT), EXXON has provided specific emission factors as would be expected if the process plant was operated as presently designed. Table 3-14 summarizes the atmospheric emissions anticipated from each process plant component source. The data provided by EXXON was utilized to conduct atmospheric dispersion modeling.

3.2.2 Air Quality Model Description

The Valley Air Quality Dispersion Model was selected for use in this case, as described in Section 1.4.1 of this Technical Report.

The model was utilized to generate reasonably accurate predictions of pollutant concentrations at pre-selected receptor sites distributed over a gridded network covering the project area and vicinity of several kilometers distance from the sources. Ground level concentrations were generated for annual and 24-hour averages, and worst-case conditions were provided for each of three pollutants (SO_2, TSP, NO_x) based on the emissions inventory of the proposed project. A worst-case analysis was considered appropriate in light of the absence of on-site specific monitoring data. The worst-case analysis allows consideration of maximum air quality degradation potential, regardless of the improbability of such degradation being eventually implemented.

Specific details of the input data and model runs are provided in Section 3.3.1.


MINE
CONCENTRATOR
PRODUCT 1 (MoS_2)
HYDROMETALLURGICAL PLANT
PRODUCT 2 (MoS_2)
PRODUCT 3 (TMO)
CONVERSION-TMO
CONVERSION-FeMo
PRODUCT 4 (FeMo)

SOURCE: EXXON MINERALS COMPANY

MT. HOPE MOLYBDENUM PROJECT

PROCESS FLOWSHEET

U.S. Department of the Interior
Bureau of Land Management

FIGURE 3-1

Table 3-14 Summary of Air Emissions from Process Plant

Concentrator

Crusher/Stockpile Reclaim - Release of scrubbed suspended particulates at the rate of 387 lb/day. 195 lb/day (87.7 kg/day) from the crusher and 192 lb/day (86.4 kg/day) from stockpile reclaim.

The crusher would be located at an elevation of 6774 ft (2066 m) and the stack would be 33 ft (10 m) high. The stockpile would be located at 6705 ft (2045 m) and the stack would be 33 ft (10 m) high.

Hydrometallurgical Plant

Dryer flue gas - Release of water vapor from dryer at the rate of 8.1 lb/min (3.7 kg/min), entrained air, and a possible oil fume derived from burning an oily concentrate.

Oil-fired heater - Residual gas from burning 1350 lbs (613 kg) No. 2 fuel oil/day. Oil of typical composition.

Chlorine scrubbing tower - Intermittent release of chlorine gas not to exceed regulatory limits. Before release, stream would be scrubbed using sodium hydroxide solution.

Vent air filter - Possible intermittent release of displaced air containing TMO particles.

Vapor separator - Release occurring only in event of excursion from normal operation. Vapor separator to accept contents of leach autoclaves and condense vapor.

The hydrometallurgical plant would be at an elevation of 6682 ft (2038 m) and each stack would be 77 ft (24 m) high with the exception of the vent filters which would be 25 ft (7.5 m) high.

Table 3-14 Summary of Air Emissions from Process Plant (continued)

TMO Production

Scrubber -	Roaster flue gas entering scrubber would have passed through an electrostatic precipitator assumed to achieve 98% removal of solids. Scrubber assumed to achieve 97% removal efficiencies. Final emission rate is assumed to be approximately 3.17 tons/day SO_2 and 0.002 tons/day of particulates.
Vent filters (2) -	These emissions would be routed to electrostatic precipitators mentioned above and become part of the above stream.
Vent air filters (2) -	Intermittent release of ambient air.

The TMO plant would be at an elevation of 6682 ft (2038 m) and the scrubber stack would be 120 ft (37 m) high.

FeMo Production

Vent filters -	Intermittent release of ambient air.
Stack gas -	Release of approximately 5000 scf/min (141 m^3/min) composed mostly of air and small quantities of water vapor and CO_2 at slightly elevated temperatures.

The Femo plant would be at an elevation of 6682 ft (2038 m) and the stack would be 79 ft (24 m) high.

Note: All stack heights include height of structures.

Source: EIR.

3.2.3 Fugitive Dust Evaluation

In addition to the evaluation of the total suspended particulates (TSP) generated in mining and processing operations and emitted as point source pollutants after application of Best Available Control Technology (BACT), there exists a need to evaluate the quantity of pulverized soil particles caused by the proposed action to become airborne.

The methodology utilized to evaluate fugitive dust followed U.S. Environmental Protection Agency (EPA) guidelines as provided in a publication of the American Mining Congress entitled "Fugitive Dust Emission Factors for the Mining Industry" (July 1983). Section 3.3.2 details the results of the fugitive dust inventory.

3.2.4 Visibility Impairment Analysis

The potential for impairment of visibility due to the proposed action was investigated utilizing methodology as described in the U.S. Environmental Protection Agency (EPA) Workbook For Estimating Visibility Impairment (1980). The potential for impact was evaluated with particular emphasis upon determining project effects, if any, upon the visibility resource of the Robert's Wilderness Study Area.

3.2.5 Air Quality Impact on Soils and Vegetation

As discussed in Section 4.4.2 of the Environmental Impact Statement, the potential for impacts on soils and vegetation due to atmospheric pollutants infringement was evaluated.

The evaluation consisted of a review of NAAQS guidelines established by the EPA in light of the pollutant concentrations at receptor sites as provided in the results of air quality modeling efforts.

Technical Report No.5, Soil Resources (section 3.3.3, pp. 3-18 to 3-21), provides an ancillary analysis of aeolian losses of soil related to the proposed action.

3.3 Impacts to Climatology

The climate of the site study area would not be impacted by the implementation of the proposed action or alternatives. Insignificant incidences of microclimatic events (e.g., tailings pond fogging or "misting", swirlwind ground currents near the mine pit) may occur immediately on-site to a very limited extent. More important to the consideration of climatic characteristics is the effect that the existing climatological regime would have upon other, directly project-related impacts such as atmospheric pollutant dispersion (mixing height), reclamation success (precipitation), and soil erosion (flood events). Such considerations have been discussed in the appropriate topical Technical Reports.

3.4 Impacts to Air Quality

3.4.1 Proposed Action

This section addresses the 24-hour and annual average TSP and SO_2 air quality model simulations of the proposed project emissions.

Modeling Methodology. The Mt. Hope Molybdenum Mine/Process Plant is situated in the rugged terrain area of north-central Nevada. As a result of the location in complex terrain, the EPA Valley Model was selected to determine the 24-hour and annual average TSP and SO_2 concentrations.

The model calculates 24-hour and annual average ground-level concentrations at 112 receptor locations. These locations were defined by a scaling factor for geographic spacing and terrain elevations for vertical spacing. The meteorological data utilized for annual average simulations consisted of a joint frequency distribution of stability class, wind speed and wind direction (STAR data).

The Valley Model should use the following worst-case assumptions for 24-hour averages: 1) Pasquill-Gifford F-stability; 2) wind speed of 2.5 mps; and 3) six hours of occurrence for a 24-hour period.

The Valley Model technique for estimating plume impact in complex terrain depends on atmospheric stability. For unstable and neutral conditions, the elevated plume is assumed to follow terrain, that is, the effective plume height (physical stack height plus plume rise) above the surface is constant regardless of terrain variations.

For stable meteorological conditions, the plume does not follow terrain but remains horizontal once it reaches its effective stack height. The plume center line is assumed to remain a minimum of ten meters from elevated terrain. The concentrations decay to zero between the point of impact of the centerline on elevated terrain and a location 400 meters higher on the elevated terrain. This reflects the fact that the plume is assumed to be deflected by the elevated terrain. A complete discussion of the Valley Model is presented in the Valley Model User's Guide (Burt, 1977).

In the present application, SO_2 and TSP ground level concentrations were simulated at 112 receptors to a distance of 7.0 km from the proposed Mt. Hope site. The model simulations also utilized the Briggs 2.6 stable plume rise constant and buoyancy induced dispersion option. The simulations were performed for assumed worst-case 24-hour, and annual average concentrations.

Model Input Data. Table 3-15 lists the source input data for the proposed facility used in the SO_2 and TSP model runs. The emissions data were obtained from EXXON Minerals Company. The SO_2 simulations were performed for the dryer flue, oil fired heater and scrubber source emissions. Simulations of TSP were conducted for the scrubber, crusher and stockpile sources.

The meteorological inputs to the Valley Model simulations are presented in Table 3-16. The ambient temperature and pressure were obtained from three years (September, 1979 to October, 1982) of historical data statistics collected at Elko, Nevada. The average mixing height used in both temporal simulations was taken from inversion statistics collected at Ely, Nevada. In both cases, Eureka County data was not available.

The 24-hour average simulation assumed a wind blowing from ENE through SSE, a wind speed of 2.5 mph and a Pasquill-Gifford F stability

Table 3-15 Valley Model Emissions Input

Source	Emission Rates (g/s)		Stack Height (m)	Stack Diameter (m)	Exhaust Temperature (°k)	Stack Gas Exit Velocity (m/s)	Ground Elevation msl(ft)
	SO_2	TSP					
Dryer Flue	0.14	0.01	24	1	352	3	6,800
Oil Fired Heater	0.14	0.002	24	1	589	5	6,800
Scrubber	7.86	0.02	37	1	319	3	6,800
Crusher	-	1.02	10	1	282.6	1	6,800
Stockpile	-	1.01	10	1	282.6	1	6,800
Total (g/s)	8.14	2.062					

Dryer Flue and Oil Fired Heater were not included in TSP simulations.

Mt. Hope Molybdenum Project

Table 3-16 Valley Model Meteorological Input

Model Run	Ambient Temperature (°k)	Ambient Pressure (mb)	Average Mixing Height (m)	Wind Speed (m/s)	Wind Direction	Pasquill-Gifford Stability
24-hour Average	282.6	845.5	1,316.0	2.5	ENE to SSE	F
Annual Average	282.6	845.5	1,316.0	STAR	STAR	STAR

class. Wind direction range was selected because the plume would advect into the complex terrain areas from WSW through NNW. The annual average simulation utilized annually averaged Stability and Wind Rose (STAR) data collected at Elko, Nevada.

The receptor ring spacing from the sources, for both model simulations was 1.0 kilometer. Receptor elevations were chosen (feet above mean sea level) for each of the 7 rings and 16 cardinal wind directions. Figures 3-2 and 3-3 show the receptor grid for the 24-hour and annual average runs. Table 3-17 lists the receptor height elevations. Reproduced copies of all Valley Model input files are presented in Appendix 3-B.

Model Results- TSP. The annual average and 24-hour maximum average TSP concentrations resulting from the process plant operations are shown in Figures 3-4 and 3-5, respectively. The peak annual concentration of 11.9 ug/m^3 would occur southwest of the process plant boundary. Predicted concentrations decrease to 1.0 ug/m^3 within a cicular radius of five kilometers of the process plant. The maximum 24-hour average concentration of 38.4 ug/m^3 would occur to the north-northeast and just outside the process plant facility. Within three kilometers of the facility, the predicted concentrations would decrease to 5 ug/m^3.

Table 3-18 presents a comparison of NAAQS and maximum at-source model predictions. The maximum model predictions are well within the applicable primary and secondary concentration standards. Increment consumption (see Appendix 3-C for regulatory description) per the outlines of EPA Region IX (M. Haber, EPA Region IX, personal communication, 1984) would be defined as the TSP (and SO_2) concentration occurring at the project acquisition boundary as public access restriction would occur thereof. As indicated on Table 3-18, the TSP increment consumption would, for permit purposes, be defined as less than 2.95 of the allowable 19 ug/m^3 (annual) and 4.18 of the allowable 37 ug/m^3 24-hour average.

Model Results SO_2. The annual average and 24-hour maximum average SO_2 concentrations resulting from the process plant operations are shown in Figures 3-6 and 3-7, respectively. The peak annual concentration of 48.9 ug/m^3 would

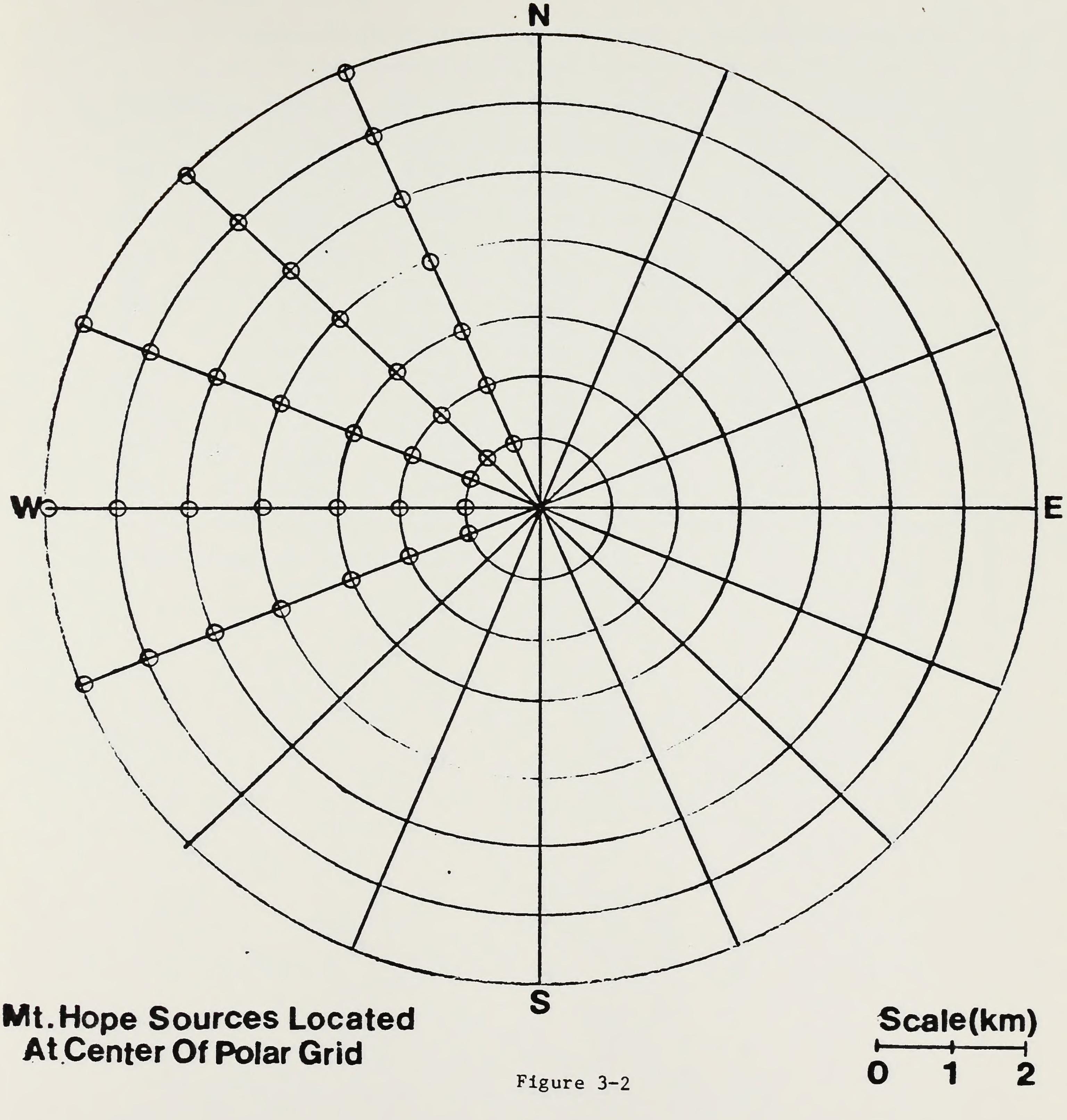

N
W
E
S
Mt. Hope Sources Located At Center Of Polar Grid
Scale(km)
0
1
2

Figure 3-2

Valley Receptor Grid

Locations Used in 24-Hour Average Analysis

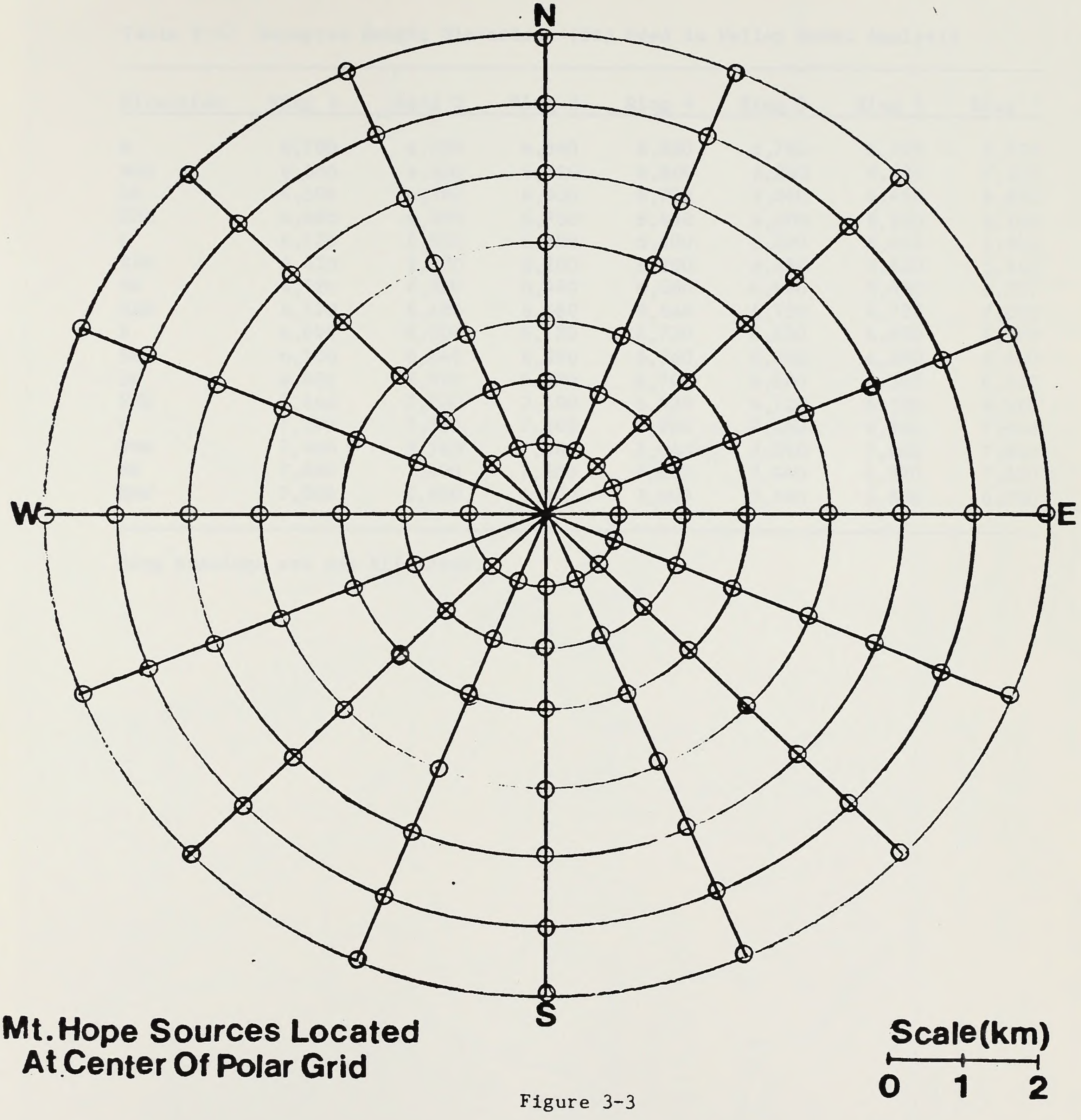

N
E
S
W
Mt. Hope Sources Located At Center Of Polar Grid
Scale(km)
0
1
2

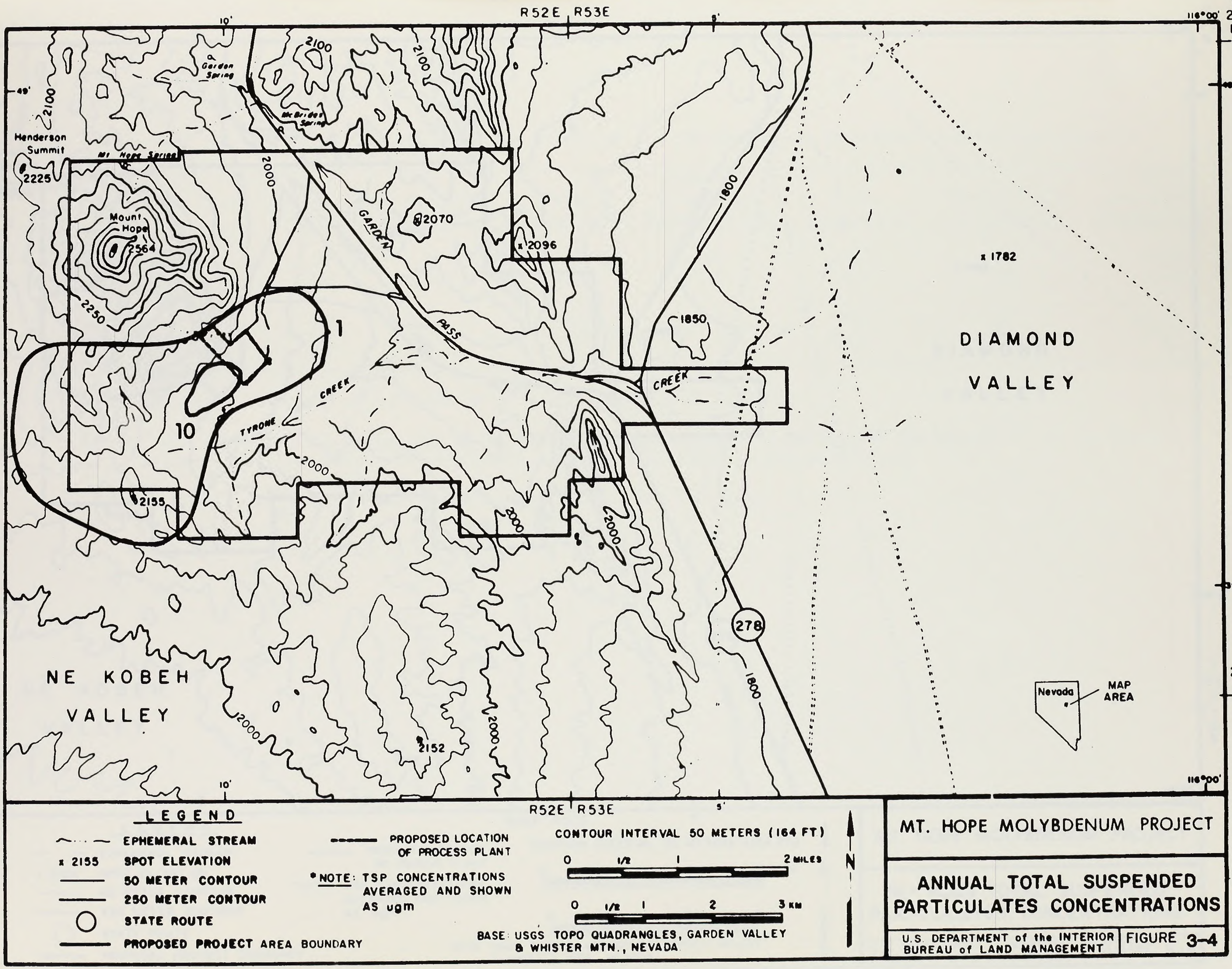
Figure 3-3

Valley Receptor Grid
Locations Used in Annual Average Analysis

Table 3-17 Receptor Height Elevations (ft) Used in Valley Model Analysis

Direction	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6	Ring 7
N	6,780	6,700	6,680	6,680	6,760	6,720	6,520
NNE	6,600	6,500	6,720	6,800	6,800	6,820	7,200
NE	6,500	6,360	6,500	6,720	7,080	6,440	6,880
ENE	6,480	6,300	6,700	6,440	6,200	6,160	6,100
E	6,420	6,300	6,300	6,400	6,200	6,040	5,960
ESE	6,420	6,300	6,200	6,200	6,280	6,400	5,960
SE	6,520	6,300	6,440	6,680	6,680	6,480	6,300
SSE	6,520	6,400	6,680	6,640	6,720	6,720	7,062
S	6,640	6,500	6,720	6,720	6,600	6,600	6,500
SSW	6,500	6,640	6,880	6,760	6,600	6,500	6,400
SW	6,880	6,920	6,920	6,760	6,680	6,560	6,520
WSW	7,240	7,200	7,100	6,920	6,720	6,700	6,560
W	7,240	7,360	7,160	6,960	7,240	6,960	7,000
WNW	7,480	8,180	7,360	7,040	7,240	7,600	7,880
NW	7,600	7,600	7,200	7,080	7,040	6,920	7,200
NNW	7,000	6,900	6,800	7,000	7,440	6,800	6,720

Ring spacings are one kilometer.

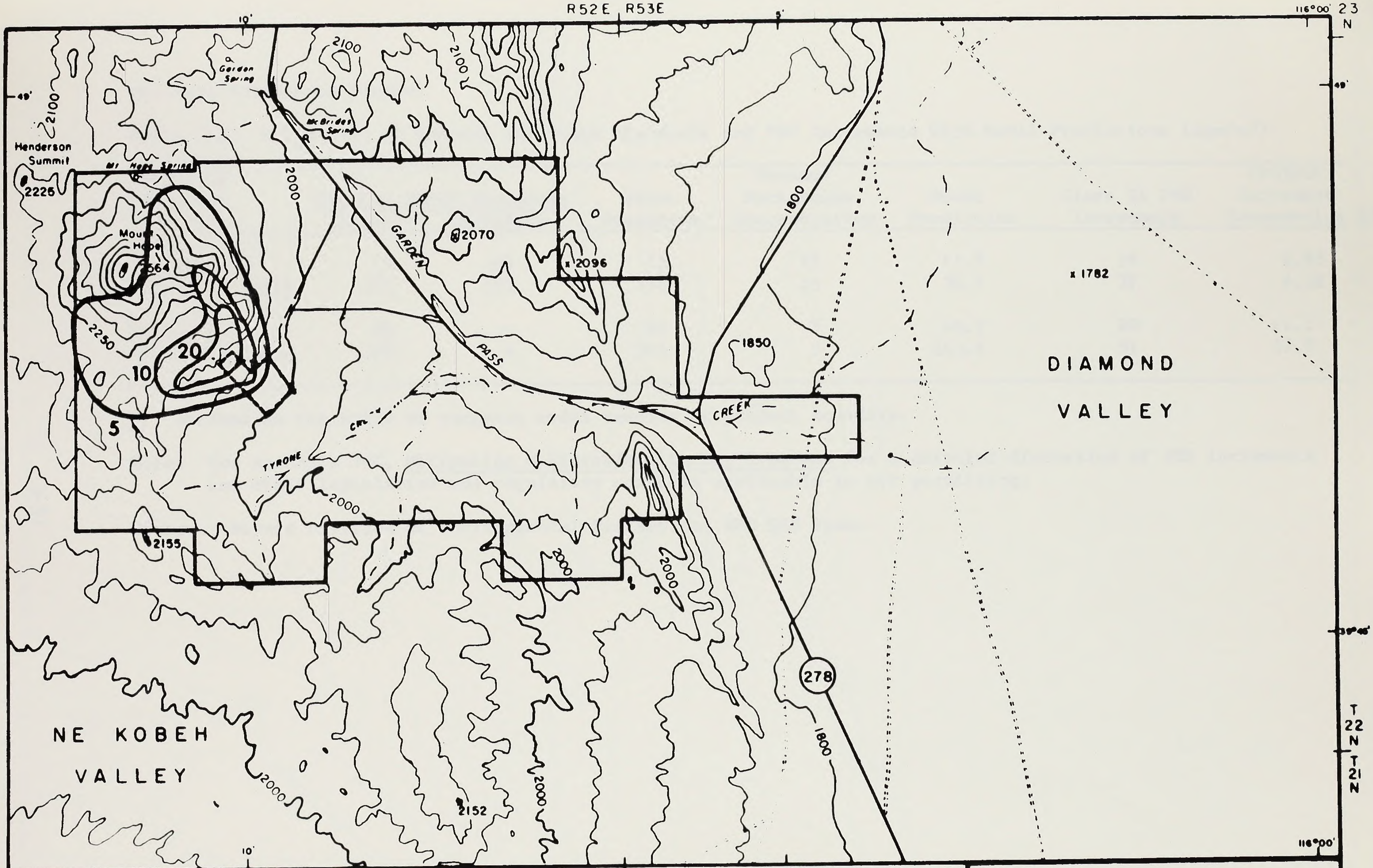

R52E R53E
10'
5'
116°00'
T 23 N
T 22 N
T 21 N
49'
39°45'
Henderson Summit
2225
2100
Garden Spring
McBride Spring
Mt Hope Spring
2100
2000
Mount Hope
2564
2250
GARDEN
PASS
CREEK
2070
x 2096
1800
x 1782
1850
DIAMOND
VALLEY
1
10
TYRONE
CREEK
2000
2155
278
NE KOBEH
VALLEY
2152
Nevada
MAP AREA
LEGEND
EPHEMERAL STREAM
x 2155 SPOT ELEVATION
50 METER CONTOUR
250 METER CONTOUR
STATE ROUTE
PROPOSED PROJECT AREA BOUNDARY
PROPOSED LOCATION OF PROCESS PLANT
*NOTE: TSP CONCENTRATIONS AVERAGED AND SHOWN AS ugm
CONTOUR INTERVAL 50 METERS (164 FT)
0 1/2 1 2 MILES
0 1/2 1 2 3 KM
N
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY & WHISTER MTN., NEVADA

MT. HOPE MOLYBDENUM PROJECT

ANNUAL TOTAL SUSPENDED PARTICULATES CONCENTRATIONS

U.S. DEPARTMENT of the INTERIOR
BUREAU of LAND MANAGEMENT

FIGURE 3-4


R52E R53E
10'
5'
116°00'
T 23 N
49'
39°45'
T 22 N
T 21 N
Henderson Summit
2225
2100
Garden Spring
McBrides Spring
Mt Hope Spring
Mount Hope
2564
2250
20
10
5
2000
GARDEN
PASS
CREEK
2070
2096
1800
1850
1782
DIAMOND VALLEY
TYRONE
CR
2155
2000
NE KOBEH VALLEY
2152
278
LEGEND
EPHEMERAL STREAM
x 2155 SPOT ELEVATION
50 METER CONTOUR
250 METER CONTOUR
STATE ROUTE
PROPOSED PROJECT BOUNDARY
PROPOSED LOCATION OF PROCESS PLANT
*NOTE: TSP CONCENTRATIONS AVERAGED AND SHOWN AS ugm
CONTOUR INTERVAL 50 METERS (164 FT)
0 1/2 1 2 MILES
0 1/2 1 2 3 KM
N
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY & WHISTER MTN., NEVADA

MT. HOPE MOLYBDENUM PROJECT

24-HOUR TOTAL SUSPENDED PARTICULATES CONCENTRATIONS

U.S. DEPARTMENT of INTERIOR
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FIGURE 3-5

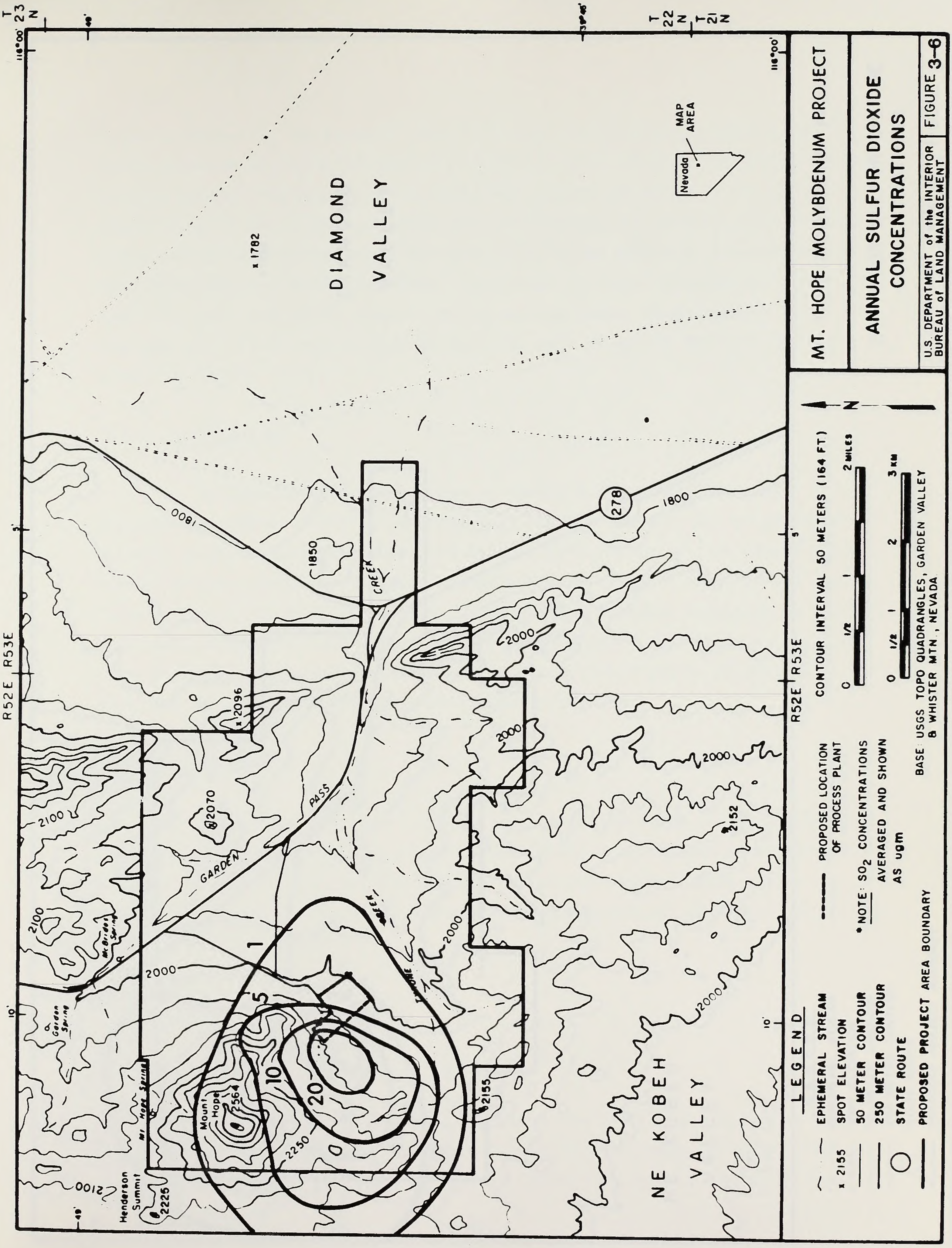
Table 3-18 Comparison of Federal and State Standards and PSD Increments With Model Predictions (ugm/m^3)

Pollutant Averaging Time 1/	Federal NAAQS Standards		State Standards	Assumed Background Concentration	Model Prediction	Class II PSD Increments	Project Increment Consumption 1/
	Primary	Secondary					
TSP Annual	75	60	75	25	11.9	19	2.95
TSP 24-hr (avg)	260	150	150	25	38.4	37	4.18
SO_2 Annual	80	-	80	5	48.9	20	11.3
SO_2 24-hr (max)	365	-	365	5	163.5	91	17.9

1/ Defined on the basis of computer model results at project boundary.

Note: See Appendix 3-C, Mitigating Measures/Monitoring Programs for a detailed discussion of PSD increments and other legislative and regulatory controls applicable to air permitting.

Source: Nevada Division of Environmental Protection, WRC EIS Team.



DIAMOND VALLEY
NE KOBEH VALLEY
GARDEN PASS
CREEK
TONKIN CREEK
278
R52E R53E
T 23 N
T 22 N
T 21 N
116°00'
39°45'
40'
5'
10'
Henderson Summit
2225
Mount Hope
2564
Mt Hope Spring
Garden Spring
McBrides Spring
1782
1850
2096
2070
2152
2155
1800
2000
2100
2250
1
5
10
20
Nevada
MAP AREA
N
LEGEND
EPHEMERAL STREAM
x 2155 SPOT ELEVATION
50 METER CONTOUR
250 METER CONTOUR
STATE ROUTE
PROPOSED PROJECT AREA BOUNDARY
PROPOSED LOCATION OF PROCESS PLANT
* NOTE: SO2 CONCENTRATIONS AVERAGED AND SHOWN AS ugm
CONTOUR INTERVAL 50 METERS (164 FT)
0 1/2 1 2 MILES
0 1/2 1 2 3 KM
BASE: USGS TOPO QUADRANGLES, GARDEN VALLEY & WHISTER MTN., NEVADA

MT. HOPE MOLYBDENUM PROJECT

ANNUAL SULFUR DIOXIDE CONCENTRATIONS

FIGURE 3-6

U.S. DEPARTMENT of the INTERIOR
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occur southwest of the process plant boundary. Predicted concentrations would decrease to 1.0 ug/m^3 within a circular radius of five kilometers of the process plant. The maximum 24-hour average concentration of 163.5 ug/m^3 would occur to the north-northwest and just outside the process plant facility. Predicted concentrations would decrease to 10 ug/m^3 within a circular radius of five kilometers of the facility. Predicted increment consumption (less than 11.3 and 17.9 ug/m^3, annual and 24-hour averages, respectively) and average and 24-hour concentrations would be well below the NAAQS primary standards (Table 3-18).

3.4.2 Alternatives

No alternatives (except the no action alternative) have been developed relative to the proposed process plant. However, as the proposed process plant complex represents the maximum facility capability conceivable at the present time, any eventual change would result in a reduction of point sources (e.g., no hydrometallurgical plant) and a probable reduction in TSP/SO_2 increment consumption and ground level concentrations. In any case, neither increment consumption or ground level concentrations would be expected to increase from that described for the proposed action.

3.4.3 No Action

Implementation of the no action alternative would result in the maintenance of status quo air quality conditions, i.e., estimated 24 ug/m^3 or less of TSP and 5 ug/m^3 or less of SO_2. As in the proposed action, air quality condition would remain below NAAQS and significant increment allowances would remain available.

3.5 Fugitive Dust Evaluation

3.5.1 Proposed Action

Analysis was performed to determine the worst-case conditions for fugitive dust emissions from the proposed action, following EPA guidelines as presented by the American Mining Congress (1983) for each of the first five

years of operation of the Mt. Hope Project. Eight major activities were each analyzed for two phases, construction phase and operation, for a total of sixteen activity types.

The wind erosion fugitive emission factor was generated for each activity by the standard equation:

EF = Tons/Acre/Year = AIKCL'V'

The assumptions utilized were the following:

A = wind erosion loss as suspended particulates
for mine area soil type, rocky/gravelly = 0.025
for other areas soil type, sandy = 0.010
Ref. (rocky/gravelly) HDR. 80 p. 4-33.

B = soil erodibility in tons/acre/year (T/A/Y)
for mine area, rocky/gravelly soils = 38
for other areas, sandy soils = 134
Ref. AMC p. 52

K = surface roughness (worst-case = 1.0) = 1.0
(a lower factor could be used based on actual conditions)

C = climactic factor (worst-case = 1.0) = 0.3
based on 30% days wet
Ref. HDR, 80 p. 4-28

L'= unsheltered field (worst-case = 1.0) = 1.0

V'= vegetative cover (worst-case = 1.0) = 1.0
(revegetation causes reduction in factor)

EF = (0.025) (38T/A/Y) (1.0) (0.3) (1) (1)=0.285 for mine areas
EF = (0.010) (134T/A/Y) (1.0) (0.3) (1) (1)=0.402 for other areas

Tables 3-19 through 3-23 present the results of analysis for years 1 through 5 of the project. Actual emissions of fugitive dust from the listed activities varies little, from a high of 339.5 tons per year in Year One to a low of 261.7 tons per year in Year Two. While these figures are well within the normal range for open-pit mines, they do not reflect the proposed mitigation measures described in Appendix 3-C of this Technical Report, which can markedly reduce fugitive emissions.

In addition to the eight major activities analyzed, additional studies on fugitive emissions caused by haul trucks are presented. The standard emission factor formula accepted by EPA was used to determine emissions from haul trucks traveling to access the non-mineralized material storage area, the process plant and the mine.

The distance between the mine and the non-mineralized material storage area would be approximately 1.25 miles, and the distance to the process area would be approximately 1.0 mile. Quantities to each receiving area were based on the estimated 120,000 tons per day which would yield 90,000 tons per day of non-mineralized material and 30,000 tons per day of ore.

The emissions factor calculated was the following:

$$EF = (0.81s)\ \frac{(S)}{(30)}\ \frac{(365-W)}{365}$$

The assumptions used were:

s = 20 (% silt) road surface material
S = 30 (mph) average vehicle speed
W = 80 (tons) average vehicle weight

EF = 12.64 lbs/Vehicle Mile Traveled (VMT)

Using 120-ton trucks would require 750 trips per day to the non-mineralized material storage area and 250 trips per day to the process plant. This produces 11.85 tons per day (non-mineralized area) plus 3.15 tons per

Table 3-19 Year 1 Fugitive Emissions from Wind Erosion

Activity Type	Area Affected (Acres)	Emission Factor (T/A/Y)	Annual Emissions (Tons)	Time Exposed (Year)	Actual Emissions (Tons)
POWER LINE-C	345	.402	138.69	.22	30.67
POWER LINE-O	41	.402	16.48	.78	12.84
WATER LINE-C	132	.402	53.06	.32	16.86
WATER LINE-O	42	.402	16.88	.68	11.52
STATE HWY-C	67	.402	26.93	.67	17.96
STATE HWY-O	63	.402	25.33	.33	8.44
MINE PIT-C	0	.285	-----	-----	-----
MINE PIT-O	0	.285	-----	-----	-----
NON MINERAL-C	0	.285	-----	-----	-----
NON MINERAL-O	0	.285	-----	-----	-----
PROCESS PLANT-C	100	.402	40.20	1.00	40.20
PROCESS PLANT-O	0	.402	-----	-----	-----
TAIL POND-C	300	.402	120.60	1.00	120.60
TAIL POND-O	0	.402	-----	-----	-----
SUBDIVISION-C	200	.402	80.40	1.00	80.40
SUBDIVISION-O	0	.402	-----	-----	-----
TOTALS	1290				339.49

KEY: C=CONSTRUCTION, O=OPERATION
REF: .285=ROCKY,GRAVELLY P.52 AMC "FUG DUST REPORT"
.402=SANDY P.52 AMC "FUG DUST REPORT"

Table 3-20 Year 2 Fugitive Emissions from Wind Erosion

Activity Type	Area Affected (Acres)	Emission Factor (T/A/Y)	Annual Emissions (Tons)	Time Exposed (Year)	Actual Emissions (Tons)
POWER LINE-C	0	.402	-----	-----	-----
POWER LINE-O	41	.402	16.48	1.00	16.48
WATER LINE-C	0	.402	-----	-----	-----
WATER LINE-O	42	.402	16.88	1.00	16.88
STATE HWY-C	0	.402	-----	-----	-----
STATE HWY-O	63	.402	25.33	1.00	25.33
MINE PIT-C	0	.285	-----	-----	-----
MINE PIT-O	0	.285	-----	-----	-----
NON MINERAL-C	0	.285	-----	-----	-----
NON MINERAL-O	0	.285	-----	-----	-----
PROCESS PLANT-C	0	.402	-----	-----	-----
PROCESS PLANT-O	5	.402	2.01	1.00	2.01
TAIL POND-C	300	.402	120.60	1.00	120.60
TAIL POND-O	0	.402	-----	-----	-----
SUBDIVISION-C	200	.402	80.40	1.00	80.40
SUBDIVISION-O	0	.402	-----	-----	-----
TOTALS	651				261.70

KEY: C=CONSTRUCTION, O=OPERATION

REF: .285=ROCKY,GRAVELLY P.52 AMC "FUG DUST REPORT"
.402=SANDY P.52 AMC "FUG DUST REPORT"

Table 3-21 Year 3 Fugitive Emissions from Wind Erosion

Activity Type	Area Affected (Acres)	Emission Factor (T/A/Y)	Annual Emissions (Tons)	Time Exposed (Year)	Actual Emissions (Tons)
POWER LINE-C	0	.402	-----	-----	-----
POWER LINE-O	41	.402	16.48	1.00	16.48
WATER LINE-C	0	.402	-----	-----	-----
WATER LINE-O	42	.402	16.88	1.00	16.88
STATE HWY-C	0	.402	-----	-----	-----
STATE HWY-O	63	.402	25.33	1.00	25.33
MINE PIT-C	34.6	.285	9.86	.25	2.47
MINE PIT-O	34.6	.285	9.86	.75	7.40
NON MINERAL-C	171	.285	48.74	.25	12.18
NON MINERAL-O	171	.285	48.74	.75	36.55
PROCESS PLANT-C	0	.402	-----	-----	-----
PROCESS PLANT-O	5	.402	2.01	1.00	2.01
TAIL POND-C	0	.402	-----	-----	-----
TAIL POND-O	360	.402	144.72	1.00	144.72
SUBDIVISION-C	0	.402	-----	-----	-----
SUBDIVISION-O	10	.402	4.02	1.00	4.02
TOTALS	932.2				268.04

KEY: C=CONSTRUCTION, O=OPERATION

REF: .285=ROCKY,GRAVELLY P.52 AMC "FUG DUST REPORT"
.402=SANDY P.52 AMC "FUG DUST REPORT"

Table 3-22 Year 4 Fugitive Emissions from Wind Erosion

Activity Type	Area Affected (Acres)	Emission Factor (T/A/Y)	Annual Emissions (Tons)	Time Exposed (Year)	Actual Emissions (Tons)
POWER LINE-C	0	.402	-----	-----	-----
POWER LINE-O	41	.402	16.48	1.00	16.48
WATER LINE-C	0	.402	-----	-----	-----
WATER LINE-O	42	.402	16.88	1.00	16.88
STATE HWY-C	0	.402	-----	-----	-----
STATE HWY-O	63	.402	25.33	1.00	25.33
MINE PIT-C	34.6	.285	9.86	.25	2.47
MINE PIT-O	69.2	.285	19.72	.75	14.79
NON MINERAL-C	171	.285	48.74	.25	12.18
NON MINERAL-O	343	.285	97.76	.75	73.32
PROCESS PLANT-C	0	.402	-----	-----	-----
PROCESS PLANT-O	5	.402	2.01	1.00	2.01
TAIL POND-C	0	.402	-----	-----	-----
TAIL POND-O	420	.402	168.84	1.00	168.84
SUBDIVISION-C	0	.402	-----	-----	-----
SUBDIVISION-O	10	.402	4.02	1.00	4.02
TOTALS	1198.8				336.32

KEY: C=CONSTRUCTION, O=OPERATION

REF: .285=ROCKY,GRAVELLY P.52 AMC "FUG DUST REPORT"
.402=SANDY P.52 AMC "FUG DUST REPORT"

Table 3-23 Year 5 Fugitive Emissions from Wind Erosion

Activity Type	Area Affected (Acres)	Emission Factor (T/A/Y)	Annual Emissions (Tons)	Time Exposed (Year)	Actual Emissions (Tons)
POWER LINE-C	0	.402	-----	-----	-----
POWER LINE-O	41	.402	16.48	1.00	16.48
WATER LINE-C	0	.402	-----	-----	-----
WATER LINE-O	42	.402	16.88	1.00	16.88
STATE HWY-C	0	.402	-----	-----	-----
STATE HWY-O	63	.402	25.33	1.00	25.33
MINE PIT-C	34.6	.285	9.86	.25	2.47
MINE PIT-O	103.8	.285	29.58	.75	22.19
NON MINERAL-C	172	.285	49.02	.25	12.26
NON MINERAL-O	172	.285	49.02	.75	36.77
PROCESS PLANT-C	0	.402	-----	-----	-----
PROCESS PLANT-O	5	.402	2.01	1.00	2.01
TAIL POND-C	0	.402	-----	-----	-----
TAIL POND-O	520	.402	209.04	1.00	209.04
SUBDIVISION-C	0	.402	-----	-----	-----
SUBDIVISION-O	10	.402	4.02	1.00	4.02
TOTALS	1163.4				347.43

KEY: C=CONSTRUCTION, O=OPERATION

REF: .285=ROCKY,GRAVELLY P.52 AMC "FUG DUST REPORT"
.402=SANDY P.52 AMC "FUG DUST REPORT"

day (plant) or approximately 15 tons per day. These emissions would be very localized in the project area and should not cause any measurable emissions at the property boundaries.

Two other fugitive emissions were reviewed for potential significance: production drilling and production blasting. Production drilling was estimated to produce 10.4 lbs/day or 2 tons per year while blasting was estimated to produce 312 lbs/day or about 54 tons per year based on the 350 day per year mine operation. Again, these emissions should not significantly affect air quality at the property boundary.

3.5.2 Alternatives

Except for tailings pond location, the project components of the alternatives would not present significantly variable fugitive dust emission factors from that of the proposed action. The primary contributing factors of fugitive dust emission (e.g., ore hauling, non-mineralized material storage area development, etc.) would not be significantly affected by implementation of the alternatives. As noted in the fugitive dust emissions calculated, emissions related to mining are generally contributed to the greatest extent by truck haulage; a component not variable among the alternatives.

The most significant variable among the alternatives relative to fugitive dust would be the post-reclamation aeolian loss differential at each of the alternate tailings ponds and the proposed action. As indicated by Table 3-24, Alternate Tailings Pond 4-B would experience significant aeolian losses approximately 3.5 and 1.75 fold more than Tailings Pond 4-A and 4-C, respectively. With a proposed acreage of 5,650 acres, annual aeolian loss of soil would equate to 46,330 tons of fugitive dust being deposited within the Diamond Valley area. The quantitative significance of the aeolian loss and the area of most frequent deposition was determined to justify a decision of significant adverse impact should Tailings Pond Alternate 4-B be implemented. Alternate 4-C, while being sufficiently of less quantitative impact, would result in aeolian losses greater than that anticipated at the proposed Tailings Pond 4-A.

Table 3-24 Estimated Wind Erosion Losses on Surface of Tailings Pond (per acre)

Conditions	Tailings Pond 4-A	Tailings Pond 4-B	Tailings Pond 4-C
Baseline	<0.4	1.6	<0.5
Exposed	15.2	36.4	22.4
Mulched	<0.9	<0.5	<0.6
Reveg-1 (half)	8.7	21.7	13.4
Reveg-2 (baseline values)	2.6	8.2	4.5

Source Equation: Woodruff, N.P. and F.H. Siddoway, 1965. A Wind Erosion Equation. Soil Sci. Soc. Amer. Proc. 29:602-608

3.5.3 No Action

Implementation of the no action alternative would result in a maintenance of the status quo environmental condition. Such a benefit would be low in significance relative to the proposed action due to the insignificance of fugitive dust emissions anticipated for the proposed action.

3.6 Visibility Impairment Analysis

Potential visibility impairment was investigated using the methodology described in the EPA's Workbook for Estimating Visibility Impairment (1980). The procedure, normally used to evaluate impact potential relative to a Class I air quality area, is based on a series of increasingly complex and conservative screening tests using simple algorithms and nomograms provided in the workbook. Inputs to the analysis include pollutant emissions rates, atmospheric stability and distance from source. The emissions rate of concern in the analysis involved nitrogen dioxide (NO_2), a reddish-brown gas formed during the conversion of NO_x emissions. In estimating the worst-case visual impacts for the emissions source and observer location, the worst-case meteorological conditions for plume transport were identified. Such worst-case conditions occur during light wind and limited vertical mixing. The Pasquill-Gifford stability class F, corresponds to the meteorological situation described above. The F stability class as presented by Turner (1969) was used to determine the plume dispersion coefficient (o_z) as a function of downwind distance from the source.

A further assumption regarding level-1 screening for visual impact involved the complete conversion of NO_x emissions to NO_2 in the atmosphere. This rather conservative assumption was used to effect a worst-case visual impact as a result of nitrogen dioxide gas.

Finally, throughout all level-1 screening estimates, the background visual range, r_{vo}, was assumed to be 170 km (105 miles) for the Mt. Hope region as based on the study by Trigonis and Shapland (1979). The distance from source of 10 km (approximately 6.25 miles) was used to assure appropriate inclusion of peripheral lands, particularly the Roberts Wilderness Study Area.

Level-1 Screening Analysis - Worst-case, One Day per Year

The input parameters needed to evaluate potential visibility impacts at a downwind distance (x) of 10 kilometers are as follows:

Emissions rates, $Q_{part} = 0.178$ MT/day

$Q_{NO_x} = Q_{NO_2} = 0.006$ MT/day

$Q_{SO_2} = 0.703$ MT/day

Stability class, F, then $o_z = 40$

Visual range, $r_{v0} = 170$ km.

The atmospheric dispersion coefficient, p, is calculated,

$$p = \frac{2.0 \cdot 10^8}{(10)(40)} = 5.0 \text{ X } 10^5$$

The optical thickness parameters for each plume component are as follows:

$$T_{part} = (10 \text{ X } 10^{-7})(5.0 \text{ X } 10^5)(0.178) = 0.089$$

$$T_{NO_2} = (1.7 \text{ X } 10^{-7})(5.0 \text{ X } 10^5)(0.006) = 0.00051$$

$$T_{aerosol} = (1.06 \text{ X } 10^{-5})(170)\ (0.178 + 1.31 \text{ X } 0.70) = 0.00197$$

The contrast of plume against a viewing background becomes,

$$C_1 = -\frac{.00051}{.089 + .00051} \left[1 - \exp\ (.089 - .00051)\right] \left[\exp\ (-0.78)(10/170)\right]$$

$$= -0.0057\ [-0856][0.955]$$

$$C_1 = 0.0004$$

The contrast of a terrain feature against the sky is calculated as,

$$C_2 = 1 - \frac{1}{-0.0004 + 1} \left[\exp\ (-0.089 - .00051)\right] \left[\exp\ (-1.56)(10/170)\right]$$

$$= [1 - (1.0004)(.914)][.912]$$

$$C_2 = 0.078$$

The change in sky/terrain contrast caused by plume extinction is calculated as,

$$C_3 = 0.368\ [1 - \exp\ (-0.00197)]$$

$$= (0.368)(1 - .998)$$

$$C_3 = 0.0007$$

The results of the visibility impairments analysis are shown in Table 3-25. From the plume optical thickness parameters it can be concluded that visibility degradation with respect to sky observation would be minimal and insignificant. Horizontal visibility degradation (i.e., observation from elevated terrain, etc.) would be marginally significant, and in the 10 kilometer radius area, some change in sky/terrain contrast caused by primary and secondary aerosols could occur. Level 1 calculations estimate the worst-case visual impacts that might occur about one day per year. Level 2 and 3 screening analyses are available for analysis of frequency of occurrence of impacts.

3.7 Air Quality Impact on Soils and Vegetation Analysis

The emission factor of interest in an evaluation of air quality impacts on soil and vegetation beyond the designated boundaries of the Mt. Hope project, is SO_2. Table 3-18 (Comparison of NAAQS and Predicted Model Concentrations at Mt. Hope) indicates an NAAQS Primary Standard Annual Average Concentration of 80 ug/m^3 and a maximum predicted concentration at Mt. Hope of 48.9 ug/m^3. Figure 3-6 provides isopleths of the predicted maximum average annual concentrations, demonstrating that the 1.0 ug/m^3 and 5.0 ug/m^3 isopleths extend beyond the western boundary of the project. The 1.0 ug/m^3 isopleth extends approximately one kilometer beyond the boundary and the highest concentration at the boundary reaches approximately 7 ug/m^3, or less than one tenth of the NAAQS Primary Standard.

Figure 3-7, Predicted Maximum 24-hour Average SO_2 Concentrations from Mt. Hope Project, illustrates that the 10 ug/m^3 isopleth extends beyond the project boundaries to the west and north by less than one kilometer, and an estimated maximum concentration at the boundary due west of the process plant reaches approximately 17 ug/m^3. The NAAQS Primary Standard for 24-hours is 365 ug/m^3.

Since both the annual and 24-hour predicted maximum concentrations beyond the designated project boundaries are insignificant in comparison with the established NAAQS primary standards, a conservative basis exists to conclude that no significant air quality impacts on soils and vegetation beyond the designated project boundaries would be expected. This conclusion would be

Mt. Hope Molybdenum Project

Table 3-25 Level 1 Visibility Impairment Screening Analysis 1/

Emission Rates (Metric tons/day)	Plume Optical Thickness	Optical Contrast Parameter 2/	
$Q_{Part.}$ = 0.178	Part. = 0.089	C_1 = 0.0004	
Q_{NO_2} = 0.006	NO_2 = 0.00051	C_2 = 0.078	3/
Q_{SO_2} = 0.703	aerosol = 0.00197 (SO_2 emissions)	C_3 = 0.0007	3/

1/ U.S. Environmental Protection Agency, 1980. Analysis based on equations specified in Workbook for Estimating Visibility Impairment.

2/ C_1 is the contrast of the plume against the sky. C_2 is the plume contrast against terrain. C_3 is the change in sky-to-terrain contrast caused by primary and secondary aerosol. If the contrast parameters have absolute values each less than 0.10, the EPA guidelines allow an assumption that visibility degradation would be minimal.

3/ Since C_2 and C_3 exceed 0.10, the level 1 screening analysis indicates a need to conduct level 2 screening analysis. Further level 2 or level 3 analysis may show that visual impact is not severe or adverse.

Calculation Factors:

Minimum distance from the Mt. Hope Project to a potential future Class I sensitivity area (within Roberts Wilderness Study Area) - 10 kilometers, 6.25 miles (conservative value).

Pasquill-Gifford, σ_z under F stability at 10 km = 40m (131 ft)

Regional Background Visual Range = 170 km (106 mi)

Plume Dispersion Parameter = 5.0×10^5

Source: WRC EIS Team

similar under the alternative cases.

Specific details of the input data and model runs are provided in Appendix 3-B.

CHAPTER 4.0

LIST OF REVIEWERS AND PREPARERS

4.1 Reviewers - Bureau of Land Management

ED TILSEY, Nevada State Environmental Specialist.

B.S. Wildlife, University of Montana.

Experience includes nine years in environmental protection with Bureau of Land Management; overall document review.

NEIL D. TALBOT, Area Manager.

B.S. Range Management, Utah State University, Logan.
Experience includes twenty years with Bureau of Land Management; team leader.

TERESA McPARLAND, Area Geologist

B.A. Geology, Stephens College, MO.

Experience includes four years experience with Bureau of Land Management; coordinator, writer-editor; geology review.

MARK H. DAVIS, Area Wildlife Biologist

B.S. Biology, General Science, University of Wisconsin
M.S. Wildlife Management, University of Wisconsin, Stevens Point

Licensed Associate Wildlife Biologist. Experience includes four years with Bureau of Land Management; wildlife review and technical coordination.

MARK O'BRIEN, District Watershed Specialist

B.S. Range and Wildlife Management, Humboldt State University, CA

Five years experience with Bureau of Land Management; Air quality and water rights review.

4.2 Consultants

ROBERT C. WYATT, Project Manager

B.S. in Biology, University of Miami
Post Graduate Study, Biology, University of Miami

Mt. Hope Project: Responsible for coordination of environmental discipline impact analyses (except cultural resources) and direction of the third party EIS scientific team; technical and regulatory (NEPA) oversight and management of EIS documentation; and liaison and coordination with the Bureau of Land Management (BLM) and EXXON.

Experience includes management and technical analyses of environmental impact studies involving surface and underground mines, nuclear and coal-fire electrical generating plants, petrochemical and mineral process facilities, and hazardous waste/nuclear disposal site regulatory analysis. Professional experience involving activity in 23 states, Mexico and Puerto Rico has included the technical critique and environmental discipline analysis of hydrology, air quality, chemical and mine engineering, terrestrial and aquatic biology, socioeconomics, land use, pollutant toxicity and regulatory compliance.

RANDALL K. BUSH, Geologist/Data Analyst

B.S. in Geology, University of Houston

Mt. Hope Project: Assisted in the preparation and data abstraction required for EIS technical reporting. Coordinated EIS documentation

relevant to mapping and quality assurance.

Professional experience includes technical writing and regulatory compliance documentation for numerous coal and mineral mines; technical critique of topographic and geologic data and support documentation; and land use analysis (physical environmental factors relevant to engineering planning).

KEVIN P. MULLEN, Environmental and Regulatory Analyst

B.S. in Pre-Med/Biology, Stonehill College, North Easton, Massachusetts
M.S. in Biology, Northeastern University, Boston, Massachusetts

Mt. Hope Project: Responsible for quality assurance in documentation and technical writing of elements of EIS technical reports.

Professional experience includes marine and tropical ecology/impact assessment and transfer of technology. His managerial/administrative experience includes environmental and planning studies for the petroleum, chemical, mining/metals and utilities industries. He has contributed to baseline and impact assessments related to nuclear and fossil-fuel power plants, offshore energy, coastal oil fields, port development, and agri-business. He has eight years international experience in coastal resources planning and development, higher education and formulation of environmental regulations.

KENNETH W. MACKENZIE, JR., Senior Air Quality Scientist

B.S. in Pre-Med, Wayne State University, Detroit, Michigan
M.S. in Engineering, University of Washington, Seattle, Washington

Mt. Hope Project: Responsible for assisting in impact analysis related to air quality fugitive dust emissions, noise and transportation.

Mr. MacKenzie has over twenty years experience in environmental management with both the private and public sector. He is an expert in all aspects

of regulatory compliance at U.S.E.P.A. and state levels. He has served as chairman of the Southwest Section of the Air Pollution Control Association (APCA) and as President of the Association of Local Air Pollution Control Officials (ALAPCO). He was for a number of years the Air Quality Manager for a large environmental consulting firm, and his project experience includes management of several large environmental projects. He has held the posts of chief environmental officer for the cities of Houston, Texas, and Fairbanks, Alaska. He is currently active in Houston on the Chamber of Commerce Environmental Committee and the Mayor's Environmental Task Force consulting on regulatory and air quality matters.

JAMES MIKULA, Air Quality Scientist

B. S. in Atmospheric Science, Purdue University, West Lafayette, Indiana
M. S. in Atmospheric and Oceanic Science, Old Dominion University, Norfork, Virginia

Mt. Hope Project: Provided air quality and emissions modeling expertise in developing the Valley Model results and interpretation.

Experience includes meteorology and air quality projects in the U.S. and Saudi Arabia as senior air quality scientist with several consulting firms. His expertise includes work as a major investigator for a national commission on air quality standards to review and revise PSD offset permits standards.

RICHARD TRENHOLME, Soil Scientist

B.S. in Agronomy, Texas A & M University
Post Graduate Studies - soils, Texas A & M Unviersity

Mt. Hope Project: Responsible for review and analysis of project impacts upon soils resources. Conducted analytical determinations of soil, wind and water losses. Assisted in the preparation and review of technical reports and soils mapping.

Experience includes: mapping, classification, and impact analysis of soils for surface and underground mining projects; conducting soil fertility studies; design, implementation and assessment of reclamation activities pursuant to federal and state regulations. Professional experience includes Soil Conservation Service and U.S. Forest Service employment in the western United States.

LAL BABOOLAL, Air Quality Scientist

B.S. in Physics, University of California at Los Angeles
M.S. in Physics, University of Washington
Ph.D in Atmospheric Science, University of California at Los Angeles

Mt. Hope Project: Responsible for emissions calculations used in the air quality impact analyses utilizing computer models. Assisted in the preparation of technical reports and section discussion of EIS (climatology, air quality).

Professional experience in excess of fifteen years includes program directorship for both international and domestic projects. Technical activity has involved air quality and meteorologic baseline characterizations; development and simulations of air dispersion models in coordination with regulatory and public agencies; design and management of air quality monitoring networks; and the analytical treatment of data pertinent to direct and indirect environmental air quality impacts.

VICTOR M. YAMADA, Air Quality Scientist

B.S. in Civil Engineering, University of Washington
M.S. in Environmental Engineering, University of Washington
M.B.A., Pepperdine University

Mt. Hope Project: Assisted in determinations of air quality impact and process plant environmental loadings.

Professional experience involves over fourteen years of consulting and government employment. Project specialties include fugitive dust emissions inventory and control measures design, impact analysis of alternative new source review policies and economic analysis relative to air pollution control technology. Employment history has included responsibilities as Section Chief, Air Program Development, EPA Region V.

TED R. TURK, Air Quality Analyst

B.A. in Biology, Williams College
Ph.D in Ecology, University of California, Riverside and San Diego State University

Mt. Hope Project: Responsible for evaluating air quality impacts upon vegetation and soils.

Professional experience includes design of environmental field studies, the application of advanced statistical analyses techniques, studies of botanical and zoological resources in desert and semi-arid areas and hazardous waste impact determinations relative to vegetation, wildlife and water resources.

MARK STEPHENS, Air Quality Technician

B.A. in Environmental Studies, California State University, Northridge

Mt. Hope Project: Responsible for meteorologic/air quality data gathering and assisting in data analysis exercises.

Professional experience includes air quality monitoring network establishment, data acquisition equipment maintenance and operation, and primary data review and reduction.

4.3 EXXON Minerals Company

KIT R. KRICKENBERGER, Environmental and Regulatory Affairs

B.S. Geology/Chemistry, Bowling Green State University
Ph.D. Marine Geochemistry, University of Maryland

Mt. Hope Project: Responsible for overall supervision in preparation of EIR, liaison and coordination with BLM and other federal agencies.

Experience includes management of large multi-disciplinary environmental consulting group preparation of many site-specific, regulatory and programmatic NEPA compliance documents for several federal agencies.

EDWIN S. ROUSSEAU, Engineering Advisor

B.S. Metallurgical Engineering, Michigan Technology University
B.S. Engineering Administration, Michigan Technology University
M.S. Metallurgical Engineering, University of Minnesota

Mt. Hope Project: Responsible for process design of process plant and tailings disposal system including descriptions of emissions and effluents and process wastes.

Experience includes testing, project manager and operation of large copper porphyry and uranium hydrometallurgical plants and preparation of environmental impact reports and license applications for uranium plant construction/modifications.

CHAPTER 5.0

METEOROLOGY AND AIR QUALITY GLOSSARY

Altocumulus. A cloud formation of rounded, fleecy, white or gray masses.

Altostratus. An extended cloud formation of bluish or gray sheets or layers.

Ambient Concentration. The concentration of a pollutant to which the general public is exposed. At mines, generally the air beyond the lease or permit boundary.

Anticyclone. An extensive system of winds spiraling outward from a high-pressure center, circling clockwise in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere.

Area Source. A source of typically ground-level emissions spread over a broad area which do not originate from either a well-defined line or single confined point. Most fugitive dust emissions are considered as area sources for use in dispersion modeling.

Arid. A climate in which the rainfall is insufficient to support vegetation.

Atmospheric Stability. Related to the amount of turbulent mixing in the atmosphere. The more stable the atmosphere is, the less dispersion takes place.

Background Concentration. The concentration of an air pollutant which is not directly influenced by sources related to man's activities. Also, the ambient concentration at a location prior to the establishment of a new source.

Cirrus. A high-altitude cloud composed of narrow bands or patches of thin, generally white, fleecy parts.

Climatic Factor (C). A factor used in the universal soil loss equation to estimate the effects of wind speed, evaporation and precipitation on the local wind erosion.

Convective storms. Large storms caused by the transfer of heat between regions of unequal density. This nonuniform heating creates massive motion within the atmosphere.

Cumulonimbus. An extremely dense, vertically developed cumulus with a relatively hazy outline and a glaciated top, usually producing heavy rains, thunderstorms, or hailstorms.

Cumulus. A dense, white, fluffy, flat-based cloud with a multiple rounded top and a well defined outline, usually formed by the ascent of thermally unstable air masses.

Cyclonic flow. Pertaining to cyclone. 1. A type of atmospheric disturbance characterized by masses of air rapidly circulating clockwise in the Southern

and counterclockwise in the Northern Hemisphere, about a low-pressure center, usually accompanied by stormy, often destructive, weather.

Desert. A dry, barren, often sandy region that because of environmental extremes can naturally support little or no vegetation.

Dispersion. The atmospheric processes which determine the concentration of a pollutant in the air, including turbulence, transport by wind and deposition.

Diurnal. Pertaining to or occurring in a day or each day. Occurring or active during the daytime rather than at night.

Emission. The release of a pollutant into the atmosphere.

Emission Factor (EF). A constant or equation which provides the mass of emissions for a quantity of material handled (lb/ton), for an area exposed to wind erosion (lb/acre), for a given operation (lb/blast), or for a period of an operation (lb/scraper-hour).

Emission Rate. The mass of a pollutant released into the atmosphere per unit time (i.e., g/sec, lb/hr or ton/yr) usually determined from an emission factor.

Erodibility (I). A factor used in the wind erosion equation to indicate for various soil types the maximum amount of soil that could be lost by wind erosion of a flat, bare field.

Evaporation. To convert or change into a vapor; to draw moisture from, leaving only the dry solid portion.

Evapotranspiration. A term embracing the portion of the precipitation returned to the air through direct evaporation or by transpiration of vegetation, no attempt being made to distinguish between the two. (Langbein, W.B., Trans. Amer. Geophys. Un., vol. 23, pt. 2, p. 610, 1942)

Fetch. The distance along open surface over which the wind blows.

Fugitive Dust. Dust in the atmosphere consisting mainly of coarse soil particles originating from open sources, those too great in extent to be controlled by using a stack, vent or other similar enclosed system connected to ducting.

Fugitive Emission. An emission into the atmosphere from a process which could not reasonably pass through a stack, vent or other functionally equivalent opening.

Humidity. The condition of the atmosphere in respect to water vapor; usually referring to relative humidity which is the ratio of the actual amount of water vapor present in the portion of the atmosphere under consideration to the quantity which would be there if it were saturated.

Increment. The amount of ambient concentration available for a new major source proposed in an area where the air quality is better than the national ambient air quality standards (see prevention of significant deterioration).

Inversion. A state in which the air temperature increases with increasing altitude, holding surface air down along with its pollutants.

Major Source. For mines, a new mine whose total controlled non-fugitive emissions exceed 250 tons/yr. Defined in the Clean Air Act.

National Ambient Air Quality Standards (NAAQS). Maximum concentration of pollutants allowed in ambient air as set by EPA to protect public health (primary NAAQS) and welfare (secondary NAAQS).

Opacity. The degree to which a visible plume blocks out the sky behind it.

Orographic. Pertaining to orography, the branch of physical geography which treats of mountains and mountain systems.

Particles. Very small liquid droplets or bits of solid material.

Particulate. Referring to a number of particles.

Phreatophyte. A plant that habitually obtains its required water supply from the zone of saturation, either directly or through the capillary fringe. (Meinzer, USGS WSP 494, p. 55, 1923)

Plume. A measurable increase in ambient concentration above the background due to a particular source or set of sources.

Point Source. A localized stationary emission into the atmosphere, usually through a stack or vent.

Precipitation. The discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface.

Prevention of Significant Deterioration (PSD). The portion of the federal Clean Air Act pertaining to maintaining air quality where a national ambient air quality standard is not currently exceeded.

Semi-arid. Pertaining to a subdivision of climate in which the associated ecological conditions are distinguished by short grass and best exemplified by the climate of the Steppe.

Squalls. A wind of considerable intensity caused by atmospheric instability; it comes up and dies down quickly and is sometimes accompanied by thunder, lightning, and precipitation.

Stability. Referring to how turbulent the atmosphere is. The greater the stability, the less the turbulence.

Stability Class. Several ranges of atmospheric stability. Usually six are used, A through F, for very unstable through stable conditions.

Stable. The condition of the atmosphere when turbulence is at a minimum. Mixing in the vertical is very limited.

Steppe. A vast plain, generally without forests. They are generally covered with long rough grass. A semi-arid region characterized by grasses and is not the same as prairie which develops in sub-humid areas.

Total Suspended Particulate (TSP). The size range of particles collected by the high volume sampler.

Transpiration. The process by which water vapor escapes from a living plant and enters the atmosphere.

Unstable. The condition in the atmosphere when turbulence is at a maximum. Considerable vertical motion and mixing occurs.

Virga. Wisps of precipitation streaming from a cloud but evaporating before reaching earth.

Visibility. The ability to see through the atmosphere.

Visual Range. The farthest distance at which the human eye can perceive a contrast on the horizon.

Water vapor. Water diffused as a vapor in the atmosphere, especially at a temperature below the boiling point.

CHAPTER 6.0
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APPENDIX 3-A

WEATHER DATA AS RECEIVED
FROM THE
EUREKA COUNTY COOPERATIVE EXTENSION SERVICE

Table 3-A-1 Diamond Valley Monthly Temperature Extremes and Precipitation

	Month	Maximum(°F)	Minimum(°F)	Precipitation
1981	January	60	1	.29
	February	63	-1	0
	March	64	11	.13
	April	82	14	.32
	May	76	15	1.60
	June	93	17	.20
	July	96	35	.01
	August	98	34	.07
	September	90	25	.15
	October	73	16	1.39
	November	67	2	.04
	December	62	0	.69
	Total			
1981	January	55	-24	1.32
	February	65	-3	.54
	March	61	7	.54
	April	76	10	1.11
	May	77	23	3.61
	June	87	21	.58
	July	92	37	1.07
	August	90	33	.25
	September	89	22	1.58
	October	93	8	-0-
	November	75	-10	-0-
	December	56	1	-0-
	Total	76.3	10.4	10.6

Table A-3-2 Weather Data, Diamond Valley and Town of Eureka, Nevada, 1979

	Diamond Valley						Eureka (Town)				
	Temperature (°F)						Temperature (°F)				
	Monthly Av.		Extreme				Monthly Av.		Extreme		
Month	High	Low	High	Low	Rain	Month	High	Low	High	Low	Rain
January	33	12	46	-26	0.88	January	31	13	45	-6	1.00
February	43	22	55	-13	0.46	February	39	21	52	-5	0.15
March	52	27	64	16	0.73	March	50	25	59	7	1.38
April	59	29	72	7	0.55	April	56	29	47	10	1.33
May	72	37	88	25	1.26	May	69	38	81	25	0.81
June	78	39	93	27	0.13	June	79	45	92	26	0.26
July	89	45	95	38	1.24	July	84	54	98	47	0.84
August	82	46	95	33	1.23	August	80	52	97	42	2.16
September	79	35	86	28	0.17	September	81	49	88	38	0.07
October	67	29	80	16	0.56	October	66	39	82	16	0.62
November	46	16	61	-2	0.37	November	46	22	59	3	0.51
December	48	11	61	-8	0.17	December	46	22	60	4	0.25
Total					7.75	Total					9.74
Annual Ave.	62	29				Annual Ave.	61	34			
$\frac{\text{High - Low}}{2}$	45.6					$\frac{\text{High - Low}}{2}$	47.5				

Table A-3-3 Weather Data for Diamond Valley, Nevada, 1978

Month	Average Temperature (°F) Maximim	Minimum	Rain
January	39.4	18.2	0.76
February	42.3	23.3	0
March	55.4	30.6	0.59
April	55.1	29.6	1.52
May	65.7	32.8	0.52
June	77.4	38.5	0
July	86.1	45.6	0.24
August	83.9	43.5	0.13
September	70.6	35.0	2.49
October	67.0	23.7	0.56
November	44.5	18.8	0.63
December	39.3	7.5	0.45

Table A-3-4 Weather Data for Diamond Valley and Eureka, Nevada, 1977

Diamond Valley				Eureka		
Average Temperature (°F)				Average Temperature (°F)		
Maximum	Minimum	Rain	Month	Maximum	Minimum	Rain
39.2	6.5	0.34	January	34.5	15.4	.50
50.1	13.4	0.18	February	48.6	20.9	.48
43.9	16.4	0.28	March	42.9	17.6	1.56
62.6	26.9	0.11	April	61.5	32.5	
57.4	31.9	2.09	May	57.6	35.5	3.00
80.4	44.1	0.74	June	81.0	50.0	1.50
84.2	48.1	0.12	July	86.0	53.1	0.4
81.3	47.6	1.78	August	82.4	53.4	3.34
73.6	38.7	0.35	September	73.3	46.2	0.95
68.1	29.3	0	October	66.8	36.7	0.05
52.1	22.7	0.57	November	51.1	26.5	0.50
44.7	21.1	0.67	December	45.2	22.1	0.67

By Shirley Allison

By Lester Bisoni

Table A-3-5 Diamond Valley Monthly Weather Summary, Eureka, Nevada, 1976

Month	Average Hi	Average Lo (°F)	Extreme Hi	Extreme Lo (°F)	Rain, Melted Snow, etc. (in)
January	39	12	54	-10 (2nd)	.44
February	41	18	55	-8	.55
March	44	16	63	5	.24
April	54	25	71	10	.87
May	72	36	84	27	.47
June	76	39	90	20	.38
July	84	49	(9th) 93	34	1.54
August	78	43	86	35	.46
September	72	42	90	31	1.32
October	64	26	76	11	.59
November	57	18	72	-4	.29
December	46	4	55	-8	.02
Average	61	27			.60

Table A-3-6 Weekly Data for Diamond Valley, Nevada, 1978

Week Ending		Evaporation	Rainfall	Temperature (°F)		Wind Miles
				Max.	Min.	
June	16	2.19	0	84	32	715
	23	0.48	.97	77	26	982
	30	2.38	0	83	--	1,108
July	7	2.38	0.24	90	37	1,094
	14	1.81	0.21	93	48	742
	21	2.49	0	88	45	718
	28	2.16	0	91	44	478
Aug	4	1.12	0.52	91	37	519
	11	2.09	T	92	37	503
	18	1.50	0	86	40	586
	25	1.00	0.45	84	--	777
Sept	1	1.25	0	83	32	695
	8	1.36	0	84	30	563
	15	0.33	0.80	80	41	595
	22	1.54	0	79	28	645
	29	1.47	0	81	32	515
Oct	6	1.61	0	78	30	693
	13	0.98	1.74	69	25	1,135
	20	0.72	0.02	70	21	442
	27	0.24	0.21	68	5	828
Nov	3	0.78	T	65	17	651
	10	0.72	0.07	68	18	828
	17	0.45	0.04	65	7	626
	24	Frozen	T	52	3	626
Dec	1	Frozen	0.53	48	-14	840
	8	Frozen	0.02	51	8	314
	15	Frozen	0.09	52	-3	486
	27	Frozen	0.04	46	4	250
	29	Frozen	0.06	44	11	400
Total	1975	31.05	6.01	2,142	641	19,354

Table A-3-7 Diamond Valley Maximum and Minimum Temperatures, 1970

	1970 Dates	Daily Temperatures (°F) Maximum	Minimum
March			
Monthly max.	20	49	17
Min.	11	43	6
April			
Max.	7	70	20
Min.	12	46	4
May			
Max.	18	84	39
Min.	11	52	11
June			
Max.	26	98	50
Min.	30	57	26 last frost
July			
Max.	18	97	53
Min.	1	74	32
August			
Max.	12	97	49
Min.	1	91	39
September			
First frost	13	82	29
Max.	1	86	42
Min.	25	57	15

Frost-free June 30 til September 13. 75 days

Table A-3-8 Diamond Valley Maximum and Minimum Temperatures, 1969

	1969 Dates	Daily Temperatures (°F) Maximum	Minimum
March			
Monthly max.	31	65	32
Min.	9	32	-33
April	22	77	35
Max.	7	33	15
Min.			
May			
Last frost	28	76	32
Max.	30	85	40
Min.	1	71	28
June	Missing		
July			
Max.	23	95	59
Min.	5	79	35
August			
Max.	10	98	56
Min.	29	89	31
September			
Max.	3	90	47
Min.	22	64	28

Frost-free May 28 til August 29. 93 days

Table A-3-9 Diamond Valley Maximum and Minimum Temperatures, 1968

	1968 Dates	Daily Temperatures (°F) Maximum	 Minimum
March			
Monthly max.	30	73	32
Min.	20	33	8
April			
Max.	6	54	6
Min.	30	75	21
May			
Max.	30	85	32
Min.	16	49	12
June			
Last frost	30	59	22
Max.	28	92	42
Min.	30	59	22
July			
Max.	28	95	55
Min.	1	78	31
August	Missing		
September			
First frost	4	72	28
Max.	7	87	38
Min.	22	52	12

Frost-free June 30 til September 4. 66 days

Table A-3-10 Diamond Valley Maximum and Minimum Temperatures, 1967

	1967 Dates	Daily Temperatures (°F) Maximum	Minimum
March			
Max	23	68	23
Min.	30	27	-2
April			
Max.	14	69	29
Min.	1	39	4
May			
Max.	22	88	42
Min.	13	51	21
June			
Last frost	3	66	27
Max.	26	87	45
Min.	2	55	25
July			
Max.	29	92	49
Min.	10	87	39
August			
Max.	13	89	57
Min.	7	88	37
September			
First frost	13	67	25
Max.	2	86	44
Min.	14	64	25

Frost-free June 3 til September 13. 101 days

Table A-3-11 Weather Summary for Diamond Valley, Nevada, 1982

Month	Extreme (°F)		Average (°F)		Precip.(in)	Wind (mi)
	High	Low	High	Low		
January	51	-36	32	-3.5	.85	3,625
February	59	-37	43	8	.11	1,335
March	60	4	43	23	1.56	3,211
April	78	-3	57	24	.36	3,485
May	75	17	67	31	1.04	3,665
June	87	23	66	38	.77	2,147
July	90	32	81	44	1.04	2,233
August	93	37	86	44	.99	2,068
September	90	25	70	36	3.38	1,952
October	69	9	58	24	.98	2,645
November	61	3	47	16	.49	1,054
December	54	-8	39	13	.22	2,645
					11.79	30,065

Mt. Hope Molybdenum Project

Table A-3-12 Monthly Wind Miles, Diamond Valley, Nevada, 1978-1982

Month	1978	1979	1980	1981	1982
January	2,664	2,726	2,914	1,786	3,625
February	1,316	2,915	2,977	2,531	1,335
March	1,854	2,739	4,801	4,412	3,211
April	4,317	4,405	4,193	3,929	3,485
May	4,856	3,410	3,020	4,169	3,665
June	3,001	3,041	3,692	3,349	2,147
July	3,321	3,187	2,609	2,716	2,233
August	2,750	2,153	2,567	3,460	2,068
September	2,527	2,598	2,873	2,314	1,952
October	2,644	2,120	1,962	2,110	2,645
November	2,333	2,607	2,737	3,849	1,054
December	2,584	2,678	2,021	1,631	2,645
Totals	34,167	34,579	36,366	36,256	30,065

Table A-3-13 Average Monthly Temperatures, Diamond Valley, Nevada, 1980-1981

1980			1981		
Month	High (°F)	Low (°F)	Month	High (°F)	Low (°F)
January	40.6	17.5	January	47	13.5
February	47	22	February	48.6	14
March	46	17	March	51	20
April	61	24	April	65	27
May	58	32	May	66	30
June	73.6	33	June	82	41
July	82	45	July	88	40
August	81	40	August	92	44
September	74	33.6	September	79	36
October	66	23.6	October	58	24
November	47	11.6	November	56	21
December	58.6	21	December	56	17

Table A-3-14 Monthly Extreme Temperatures, Diamond Valley, Nevada (°C)

1977			1978		
Month	High (°C)	Low (°C)	Month	High (°C)	Low (°C)
January			January	9	-21
February			February	13	-19
March			March	20	-8
April			April	21	-8
May			May	29	-6
June			June	29	-5
July			July	34	0
August	31	1	August	36	-1
September	33	-7	September	29	-4
October	26	-7	October	30	-10
November	22	-22	November	21	-17
December	22	-27	December	12	-28

Table A-3-15 Summary of Acres in Production and Crop Yield in Diamond Valley, Nevada, 1981

Total Acres in Production - 35,000

Total Acres in Alfalfa - 30,740
Average Yield - 4 tons/acre

Total Acres in Grain - 4,000
Average Yield* - 1.5 tons/acre

*Grain yield varies greatly depending on the weather.

Total Acres in Pasture - 260

APPENDIX 3-B

AIR QUALITY MODELING STUDY

The printouts of Valley model runs, as presented in the following, contain statements and labels which are, in general, self-explanatory. However the following list, extracted from The Valley Model User's Guide (Burt 1977) may help to clarify the terminology used.

--RELOCATE 2/3 INCH UP: The outermost concentration on the radial due north of center must be moved northward 2/3 inch (four printer lines) from its printed location. A similar statement applies to the outermost concentration on the south radial (requiring 2/3-inch relocation southward). Otherwise, the decimal point of the concentration value represents the position of the receptor used in the calculations.

--The source identified (INAME) is printed.

--The run identification (TITLE) is printed, with a line feed following column 20 of the input record.

--HLIFE = ____HRS.

--CONCTR CORRCTD TO STD COND VIA FACTOR____: The concentrations presented have been converted to standard conditions (1013.2 mb, 298°K) via the factor shown. A factor of 1.0 implies no conversion.

--MAX TOWARD ___DEG.: Indicates the direction of the maximum concentration from the center of the map.

--NORTH TOWARD TOP

--PLOT___: This is the maximum concentration appearing on the map. It can be used as an abbreviated identifier for the map.

--The center of the programmed receptor network is indicated by a decimal point, and enclosed with asterisks; the center coordinates (460, 60) are listed.

--MULTIPLY PRINTED VALUES BY 1.0 ± ii TO GET CONC. IN (units). In this statement, the multiplier "1.0 ± ii" must be interpreted as "10. to the power ± ii," and must be applied to each concentration. The units will then be in either ppm or ug/m^3, as specified in the statement.

--SOR ELEV: The input ground elevation at the source.

--COORDX AND COORDY: The input coordinates of the source.

--STK HT: The input source emission height above ground.

--Q(GM/SEC): The emission rate, in scientific notation. For example, 2.321+03 is interpreted as 2321.

--FIXED DH: The input fixed plume rise. Asterisks in place of a numerical value indicate the user elected to use plume rises computed via the subroutine.

--BRIG.E and BRIG.F: The plume rises, in meters, for stability E and F, respectively. These are the last values returned by the plume rise subroutine during the source analysis. Hence, they are the calculated rises at the last receptor evaluated, and for the last finite wind speed used.

--DMIX: The input afternoon mixing height for long-term analyses, or the fixed mixing height for short-term analyses.

--DMNI: The input nighttime mixing height for the urban environment. Zero defaults to 100 meters.

--STAR F: The sum of all the input frequencies of the stability-wind data set used in the analysis.

--WIDTH: The input width of the square area source.

--BRIGUN: The calculated plume rise factor for nonstable atmospheric conditions. Divide by wind speed in meters per second to obtain plume rise in meters at the last receptor evaluated.

--P: The input value of pressure, or the default value.

--MWT: Molecular weight of the gaseous pollutant; used in calculating concentration in ppm:

--VV MEAN WIND SPDS VV: The input wind speeds are listed on the next line of output.

--AIR T: The input ambient temperature, or the default value.

--GAS T: The input effluent temperature.

--DIAM: The input stack diameter.

--GAS V: The input effluent exit velocity.

--FLOW: The input effluent volume flow rate, or that calculated by the program, in cubic meters/second.

--A line scale of geographical distances is output.

--RURL MODE or URBN MODE: Indicates the environment option specified by the user, i.e., rural or urban.

--LONG-TERM MODE or SHRT-TERM MODE: Indicates the averaging-time mode specified by the user. SHRT-TERM is intended to represent a 24-hour period.

--SLOPING TERRAIN CONCEPT or FLAT-PLANE CONCEPT: Indicates whether the user had or had not, respectively, input at least one finite, positive value in RECHT. If none was entered, the segment for plume height adjustment during stable conditions was skipped during the analysis.

B.1 Valley Model Input File for TSP Simulation

```
 6780 6700 6680 6680 6760 6720 6520
 6600 6500 6720 6800 6800 6880 7040
 6500 6360 6500 6760 7080 6520 6720
 6440 6300 6700 6480 6280 6160 6080
 6420 6300 6300 6400 6200 6040 5960
 6440 6300 6200 6200 6280 6820 5960
 6520 6300 6440 6720 6680 6480 6300
 6560 6360 6680 6680 6720 6720 7062
 6640 6500 6720 6760 6600 6600 6500
 6500 6680 6880 6760 6600 6500 6400
 6880 6940 6920 6760 6680 6560 6520
 7080 7240 7080 6960 6760 6720 6600
 7240 7360 7160 6960 7240 6960 7000
 7520 8320 7360 7080 7280 7520 7880
 7700 7520 7200 7080 7040 7000 7040
 7000 6900 6800 7000 7440 6800 6720
       846       283         1
TSP ANNUAL AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
125.00       1316.  3   0  6  2  1          01100
SCRUBBER (SOURCE #1)
   0.02     37   319     3.0     1.0        460.0   60.0   6800       0.0     0
CRUSHER (SOURCE #2)
   1.02     10  282.6    1.0     1.0        460.0   60.0   6800       0.0     0
STOCK PILE (SOURCE #3)
   1.01     10  282.6    1.0     1.0        460.0   60.0   6800       0.0     0
00.67      2.45     4.47      6.93      9.61      12.52
(7X,6F7.6)
   N A 0.000000.000000.000000.000000.000000.00000
 NNE A 0.000500.000140.000000.000000.000000.00000
  NE A 0.001070.000210.000000.000000.000000.00000
 ENE A 0.000500.000140.000000.000000.000000.00000
   E A 0.001260.000340.000000.000000.000000.00000
 ESE A 0.000500.000140.000000.000000.000000.00000
  SE A 0.000500.000140.000000.000000.000000.00000
 SSE A 0.001320.000270.000000.000000.000000.00000
   S A 0.003150.000680.000000.000000.000000.00000
 SSW A 0.001510.000410.000000.000000.000000.00000
  SW A 0.002510.000680.000000.000000.000000.00000
 WSW A 0.002400.000480.000000.000000.000000.00000
   W A 0.001000.000270.000000.000000.000000.00000
 WNW A 0.000750.000210.000000.000000.000000.00000
  NW A 0.000750.000210.000000.000000.000000.00000
 NNW A 0.000750.000210.000000.000000.000000.00000
   N B 0.001370.001370.000340.000000.000000.00000
 NNE B 0.001150.001230.000620.000000.000000.00000
  NE B 0.002630.001780.000750.000000.000000.00000
 ENE B 0.003060.003010.000620.000000.000000.00000
   E B 0.002410.002120.000620.000000.000000.00000
 ESE B 0.001880.001100.000340.000000.000000.00000
  SE B 0.001740.001710.000410.000000.000000.00000
 SSE B 0.001590.001030.000210.000000.000000.00000
   S B 0.004330.004250.001510.000000.000000.00000
 SSW B 0.002620.002740.001440.000000.000000.00000
  SW B 0.004220.003770.003490.000000.000000.00000
 WSW B 0.003050.003150.002810.000000.000000.00000
```

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 NNW B 0.001310.000960.000140.000000.000000.00000
   N C 0.001490.001780.001160.000070.000000.00000
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  NE C 0.001670.002050.002330.000550.000000.00000
 ENE C 0.003190.003660.002330.000340.000000.00000
   E C 0.002840.003700.001920.000270.000000.00000
 ESE C 0.001850.001990.001160.000000.000000.00000
  SE C 0.001230.000680.000410.000000.000000.00000
 SSE C 0.000580.000550.000890.000140.000000.00000
   S C 0.001840.002330.003080.000620.000000.00000
 SSW C 0.001490.001780.003970.000680.000000.00000
  SW C 0.002400.003360.008290.001710.000000.00000
 WSW C 0.002900.004320.008420.002670.000210.00000
   W C 0.004000.004790.006990.001920.000210.00000
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  NW C 0.000870.001160.001640.000340.000000.00000
 NNW C 0.000890.000680.001030.000010.000000.00000
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  NE D 0.002350.005340.007050.004320.000410.00000
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   E D 0.002730.005820.006300.000890.000070.00000
 ESE D 0.001170.002530.001100.000550.000070.00000
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   S D 0.002170.004860.008220.009180.002670.00034
 SSW D 0.002340.005070.009450.005000.000340.00007
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  NW D 0.001760.003560.004930.004110.000410.00014
 NNW D 0.001620.002950.004450.002670.000340.00000
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 ENE E 0.000000.006640.004250.000000.000000.00000
   E E 0.000000.005890.002330.000000.000000.00000
 ESE E 0.000000.001780.000210.000000.000000.00000
  SE E 0.000000.000270.000140.000000.000000.00000
 SSE E 0.000000.000750.000140.000000.000000.00000
   S E 0.000000.003150.000960.000000.000000.00000
 SSW E 0.000000.002880.000890.000000.000000.00000
  SW E 0.000000.004250.001510.000000.000000.00000
 WSW E 0.000000.004590.001990.000000.000000.00000
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 WNW E 0.000000.003700.001920.000000.000000.00000
  NW E 0.000000.002120.001230.000000.000000.00000
 NNW E 0.000000.002950.002740.000000.000000.00000
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  NE F 0.030030.012050.000000.000000.000000.00000
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  SE F 0.002970.000890.000000.000000.000000.00000
 SSE F 0.002300.000550.000000.000000.000000.00000
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   W F 0.020530.007120.000000.000000.000000.00000
 WNW F 0.011410.003630.000000.000000.000000.00000
  NW F 0.007900.002670.000000.000000.000000.00000
 NNW F 0.013900.005820.000000.000000.000000.00000
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B.2 Valley Model Input File for SO_2 Simulation

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 6500 6360 6500 6760 7080 6520 6720
 6440 6300 6700 6480 6280 6160 6080
 6420 6300 6300 6400 6200 6040 5960
 6440 6300 6200 6200 6280 6820 5960
 6520 6300 6440 6720 6680 6480 6300
 6560 6360 6680 6680 6720 6720 7062
 6640 6500 6720 6760 6600 6600 6500
 6500 6680 6880 6760 6600 6500 6400
 6880 6940 6920 6760 6680 6560 6520
 7080 7240 7080 6960 6760 6720 6600
 7240 7360 7160 6960 7240 6960 7000
 7520 8320 7360 7080 7280 7520 7880
 7700 7520 7200 7080 7040 7000 7040
 7000 6900 6800 7000 7440 6800 6720
       846       283         1
SO2 ANNUAL AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
125.00       1316.  3  0  6  2  1          01100
DRY FLUE GAS (SOURCE #1)
   0.14     24   352     3.0     1.0        460.0   60.0    6800       0.0     0
OIL FIRED HEATER (SOURCE #2)
   0.14     24  589.0    5.0     1.0        460.0   60.0    6800       0.0     0
SCRUBBER (SOURCE #3)
   7.86     37  319.0    3.0     1.0        460.0   60.0    6800       0.0     0
00.67     2.45      4.47      6.93      9.61      12.52
(7X,6F7.6)
   N A 0.000000.000000.000000.000000.000000.00000
 NNE A 0.000500.000140.000000.000000.000000.00000
  NE A 0.001070.000210.000000.000000.000000.00000
 ENE A 0.000500.000140.000000.000000.000000.00000
   E A 0.001260.000340.000000.000000.000000.00000
 ESE A 0.000500.000140.000000.000000.000000.00000
  SE A 0.000500.000140.000000.000000.000000.00000
 SSE A 0.001320.000270.000000.000000.000000.00000
   S A 0.003150.000680.000000.000000.000000.00000
 SSW A 0.001510.000410.000000.000000.000000.00000
  SW A 0.002510.000680.000000.000000.000000.00000
 WSW A 0.002400.000480.000000.000000.000000.00000
   W A 0.001000.000270.000000.000000.000000.00000
 WNW A 0.000750.000210.000000.000000.000000.00000
  NW A 0.000750.000210.000000.000000.000000.00000
 NNW A 0.000750.000210.000000.000000.000000.00000
   N B 0.001370.001370.000340.000000.000000.00000
 NNE B 0.001150.001230.000620.000000.000000.00000
  NE B 0.002630.001780.000750.000000.000000.00000
 ENE B 0.003060.003010.000620.000000.000000.00000
   E B 0.002410.002120.000620.000000.000000.00000
 ESE B 0.001880.001100.000340.000000.000000.00000
  SE B 0.001740.001710.000410.000000.000000.00000
 SSE B 0.001590.001030.000210.000000.000000.00000
   S B 0.004330.004250.001510.000000.000000.00000
 SSW B 0.002620.002740.001440.000000.000000.00000
  SW B 0.004220.003770.003490.000000.000000.00000
 WSW B 0.003050.003150.002810.000000.000000.00000
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NNW B 0.001310.000960.000140.000000.000000.00000
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ENE C 0.003190.003660.002330.000340.000000.00000
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SSE C 0.000580.000550.000890.000140.000000.00000
  S C 0.001840.002330.003080.000620.000000.00000
SSW C 0.001490.001780.003970.000680.000000.00000
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WSW C 0.002900.004320.008420.002670.000210.00000
  W C 0.004000.004790.006990.001920.000210.00000
WNW C 0.002160.002120.003080.000480.000000.00000
 NW C 0.000870.001160.001640.000340.000000.00000
NNW C 0.000890.000680.001030.000010.000000.00000
  N D 0.001890.004380.002810.002050.000270.00000
NNE D 0.001300.002880.002670.003560.000410.00000
 NE D 0.002350.005340.007050.004320.000410.00000
ENE D 0.002900.006030.007190.001580.000070.00000
  E D 0.002730.005820.006300.000890.000070.00000
ESE D 0.001170.002530.001100.000550.000070.00000
 SE D 0.000410.000820.000820.000140.000070.00000
SSE D 0.000660.001710.001230.001850.000210.00014
  S D 0.002170.004860.008220.009180.002670.00034
SSW D 0.002340.005070.009450.005000.000340.00007
 SW D 0.003840.009180.018970.009660.001370.00007
WSW D 0.004320.008700.018360.016990.003290.00034
  W D 0.005640.011370.014110.018840.003080.00034
WNW D 0.002570.005890.008490.007400.000620.00021
 NW D 0.001760.003560.004930.004110.000410.00014
NNW D 0.001620.002950.004450.002670.000340.00000
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NNE E 0.000000.002880.002600.000000.000000.00000
 NE E 0.000000.003840.003290.000000.000000.00000
ENE E 0.000000.006640.004250.000000.000000.00000
  E E 0.000000.005890.002330.000000.000000.00000
ESE E 0.000000.001780.000210.000000.000000.00000
 SE E 0.000000.000270.000140.000000.000000.00000
SSE E 0.000000.000750.000140.000000.000000.00000
  S E 0.000000.003150.000960.000000.000000.00000
SSW E 0.000000.002880.000890.000000.000000.00000
 SW E 0.000000.004250.001510.000000.000000.00000
WSW E 0.000000.004590.001990.000000.000000.00000
  W E 0.000000.007810.002330.000000.000000.00000
WNW E 0.000000.003700.001920.000000.000000.00000
 NW E 0.000000.002120.001230.000000.000000.00000
NNW E 0.000000.002950.002740.000000.000000.00000
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NNE F 0.030240.011640.000000.000000.000000.00000
 NE F 0.030030.012050.000000.000000.000000.00000
```

```
 ENE F 0.031910.013630.000000.000000.000000.00000
   E F 0.021660.008420.000000.000000.000000.00000
 ESE F 0.008710.003080.000000.000000.000000.00000
  SE F 0.002970.000890.000000.000000.000000.00000
 SSE F 0.002300.000550.000000.000000.000000.00000
   S F 0.005610.001710.000000.000000.000000.00000
 SSW F 0.005540.001370.000000.000000.000000.00000
  SW F 0.007770.002600.000000.000000.000000.00000
 WSW F 0.014440.005680.000000.000000.000000.00000
   W F 0.020530.007120.000000.000000.000000.00000
 WNW F 0.011410.003630.000000.000000.000000.00000
  NW F 0.007900.002670.000000.000000.000000.00000
 NNW F 0.013900.005820.000000.000000.000000.00000
$
```

B.3 Valley Model Output for Annual Average TSP Simulation

```
DI EPCO2
1$JOB EPCO2 1019EPCO EPCO OUT=M:EPCO2 PRI=3              21 MAY 84 11:30:07
 ===> AS 15=D:EPCO2
 ===> AS 16=L:EPCO2
 ===> *T:VALLEY
0


                         TSP ANNUAL AVERAGE A

                SPD(MPS)   0.670    2.450    4.470    6.930    9.610   12.520
  STABILITY     WIND DIR
0     A            N     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          NNE     0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
      A           NE     0.0011   0.0002   0.0000   0.0000   0.0000   0.0000
      A          ENE     0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
      A            E     0.0013   0.0003   0.0000   0.0000   0.0000   0.0000
      A          ESE     0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
      A           SE     0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
      A          SSE     0.0013   0.0003   0.0000   0.0000   0.0000   0.0000
      A            S     0.0031   0.0007   0.0000   0.0000   0.0000   0.0000
      A          SSW     0.0015   0.0004   0.0000   0.0000   0.0000   0.0000
      A           SW     0.0025   0.0007   0.0000   0.0000   0.0000   0.0000
      A          WSW     0.0024   0.0005   0.0000   0.0000   0.0000   0.0000
      A            W     0.0010   0.0003   0.0000   0.0000   0.0000   0.0000
      A          WNW     0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
      A           NW     0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
      A          NNW     0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
0     B            N     0.0014   0.0014   0.0003   0.0000   0.0000   0.0000
      B          NNE     0.0011   0.0012   0.0006   0.0000   0.0000   0.0000
      B           NE     0.0026   0.0018   0.0007   0.0000   0.0000   0.0000
      B          ENE     0.0031   0.0030   0.0006   0.0000   0.0000   0.0000
      B            E     0.0024   0.0021   0.0006   0.0000   0.0000   0.0000
      B          ESE     0.0019   0.0011   0.0003   0.0000   0.0000   0.0000
      B           SE     0.0017   0.0017   0.0004   0.0000   0.0000   0.0000
      B          SSE     0.0016   0.0010   0.0002   0.0000   0.0000   0.0000
      B            S     0.0043   0.0042   0.0015   0.0000   0.0000   0.0000
      B          SSW     0.0026   0.0027   0.0014   0.0000   0.0000   0.0000
      B           SW     0.0042   0.0038   0.0035   0.0000   0.0000   0.0000
      B          WSW     0.0030   0.0031   0.0028   0.0000   0.0000   0.0000
      B            W     0.0029   0.0030   0.0016   0.0000   0.0000   0.0000
      B          WNW     0.0027   0.0018   0.0014   0.0000   0.0000   0.0000
      B           NW     0.0014   0.0011   0.0004   0.0000   0.0000   0.0000
      B          NNW     0.0013   0.0010   0.0001   0.0000   0.0000   0.0000
0     C            N     0.0015   0.0018   0.0012   0.0001   0.0000   0.0000
      C          NNE     0.0009   0.0011   0.0011   0.0002   0.0000   0.0000
      C           NE     0.0017   0.0020   0.0023   0.0005   0.0000   0.0000
      C          ENE     0.0032   0.0037   0.0023   0.0003   0.0000   0.0000
      C            E     0.0028   0.0037   0.0019   0.0003   0.0000   0.0000
      C          ESE     0.0018   0.0020   0.0012   0.0000   0.0000   0.0000
      C           SE     0.0012   0.0007   0.0004   0.0000   0.0000   0.0000

                                1
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          C        SSE    0.0006  0.0005  0.0009  0.0001  0.0000  0.0000
          C          S    0.0018  0.0023  0.0031  0.0006  0.0000  0.0000
          C        SSW    0.0015  0.0018  0.0040  0.0007  0.0000  0.0000
          C         SW    0.0024  0.0034  0.0083  0.0017  0.0000  0.0000
          C        WSW    0.0029  0.0043  0.0084  0.0027  0.0002  0.0000
          C          W    0.0040  0.0048  0.0070  0.0019  0.0002  0.0000
          C        WNW    0.0022  0.0021  0.0031  0.0005  0.0000  0.0000
          C         NW    0.0009  0.0012  0.0016  0.0003  0.0000  0.0000
          C        NNW    0.0009  0.0007  0.0010  0.0000  0.0000  0.0000
   0      D          N    0.0019  0.0044  0.0028  0.0020  0.0003  0.0000
          D        NNE    0.0013  0.0029  0.0027  0.0036  0.0004  0.0000
          D         NE    0.0023  0.0053  0.0071  0.0043  0.0004  0.0000
          D        ENE    0.0029  0.0060  0.0072  0.0016  0.0001  0.0000
          D          E    0.0027  0.0058  0.0063  0.0009  0.0001  0.0000
          D        ESE    0.0012  0.0025  0.0011  0.0005  0.0001  0.0000
          D         SE    0.0004  0.0008  0.0008  0.0001  0.0001  0.0000
          D        SSE    0.0007  0.0017  0.0012  0.0018  0.0002  0.0001
          D          S    0.0022  0.0049  0.0082  0.0092  0.0027  0.0003
          D        SSW    0.0023  0.0051  0.0094  0.0050  0.0003  0.0001
          D         SW    0.0038  0.0092  0.0190  0.0097  0.0014  0.0001
          D        WSW    0.0043  0.0087  0.0184  0.0170  0.0033  0.0003
          D          W    0.0056  0.0114  0.0141  0.0188  0.0031  0.0003
          D        WNW    0.0026  0.0059  0.0085  0.0074  0.0006  0.0002
          D         NW    0.0018  0.0036  0.0049  0.0041  0.0004  0.0001
          D        NNW    0.0016  0.0030  0.0045  0.0027  0.0003  0.0000
   0      E          N    0.0000  0.0038  0.0016  0.0000  0.0000  0.0000
          E        NNE    0.0000  0.0029  0.0026  0.0000  0.0000  0.0000
          E         NE    0.0000  0.0038  0.0033  0.0000  0.0000  0.0000
          E        ENE    0.0000  0.0066  0.0042  0.0000  0.0000  0.0000
          E          E    0.0000  0.0059  0.0023  0.0000  0.0000  0.0000
          E        ESE    0.0000  0.0018  0.0002  0.0000  0.0000  0.0000
          E         SE    0.0000  0.0003  0.0001  0.0000  0.0000  0.0000
          E        SSE    0.0000  0.0007  0.0001  0.0000  0.0000  0.0000
          E          S    0.0000  0.0031  0.0010  0.0000  0.0000  0.0000
          E        SSW    0.0000  0.0029  0.0009  0.0000  0.0000  0.0000
          E         SW    0.0000  0.0042  0.0015  0.0000  0.0000  0.0000
          E        WSW    0.0000  0.0046  0.0020  0.0000  0.0000  0.0000
          E          W    0.0000  0.0078  0.0023  0.0000  0.0000  0.0000
          E        WNW    0.0000  0.0037  0.0019  0.0000  0.0000  0.0000
          E         NW    0.0000  0.0021  0.0012  0.0000  0.0000  0.0000
          E        NNW    0.0000  0.0030  0.0027  0.0000  0.0000  0.0000
   0      F          N    0.0319  0.0112  0.0000  0.0000  0.0000  0.0000
          F        NNE    0.0302  0.0116  0.0000  0.0000  0.0000  0.0000
          F         NE    0.0300  0.0120  0.0000  0.0000  0.0000  0.0000
          F        ENE    0.0319  0.0136  0.0000  0.0000  0.0000  0.0000
          F          E    0.0217  0.0084  0.0000  0.0000  0.0000  0.0000
          F        ESE    0.0087  0.0031  0.0000  0.0000  0.0000  0.0000
          F         SE    0.0030  0.0009  0.0000  0.0000  0.0000  0.0000
          F        SSE    0.0023  0.0005  0.0000  0.0000  0.0000  0.0000
          F          S    0.0056  0.0017  0.0000  0.0000  0.0000  0.0000
          F        SSW    0.0055  0.0014  0.0000  0.0000  0.0000  0.0000
          F         SW    0.0078  0.0026  0.0000  0.0000  0.0000  0.0000
          F        WSW    0.0144  0.0057  0.0000  0.0000  0.0000  0.0000
          F          W    0.0205  0.0071  0.0000  0.0000  0.0000  0.0000
          F        WNW    0.0114  0.0036  0.0000  0.0000  0.0000  0.0000
```

```
      F       NW      0.0079  0.0027  0.0000  0.0000  0.0000  0.0000
      F       NNW     0.0139  0.0058  0.0000  0.0000  0.0000  0.0000
1                                        0.2              /--   0.4                    2.1
                                 RELOCATE 2/3 INCH UP-/         0.7

                                            0.4                                    1.6

                                                                1.0
                        1.0                                                                               0.9
                                               0.9                            1.1

                             1.2                                                                      0.7         VALLEY
 1280                                                           0.9                                          SCRUBBER (SOURCE #1)
                                                 1.6                       1.3
                                  1.5                                                         4.5
                                                                                                        TSP ANNUAL AVERAGE A
                                                                   NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                       1.9                      1.3                    1.5
          1.0                                       0.6                   1.1                                       0.6
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA    FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 120.52
                   2.2                                                                                         0.7
                                             2.6                                    1.6
                         3.5                                    2.2                                         0.9
                                                       2.3         1.8
                                  5.8             3.2                      2.4                   1.2
                                       5.9                                                 1.7
                                                                5.0
                                              1.0       5.6        3.7             2.5
                                                             18.1     6.5
                                                     22.3  *********  5.3                                 MULTIPLY PRINTED VALUES BY
                                                           * COORD *                                       1.0E-03 TO GET CONC. IN UG/M3
     7.1      8.4      9.0     14.1     18.9     27.4     79.1  *   _._   *  6.5      3.3      2.0      1.4      1.0      0.8      0.7
                                                           * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    120.5  *********  3.8    6800.FT  460.00   60.00    37.M 2.0000E-02    ******
                                                             2.5     2.4
                                             39.7     12.5      2.1             1.6   BRIG.E  BRIG.F  DMIX     DMNI  STAR F WIDTH
                                                                2.4                     17.     17.   1316.     100.   1.00*******
                                      27.9                                           1.0
                                 22.0             35.2                    1.0              0.8                 BRIGUN P(MB)  MWT
                                                         1.0         1.1                                           19.  846.   0.0
                         2.3                                    1.3                                     0.6
                                            17.7  VV MEAN WIND SPDS(MPS) VV    0.6
                   1.5                 0.67000  2.45000  4.47000  6.93000  9.61000 12.52000                       1.8

         0.6                                           10.7              0.7                                          0.4
                                       2.0                      1.1                     0.6
                                                                                                    AIR T   GAS T    DIAM  GAS V   FLOW
                                                                                                     283.    319.     1.0    3.0    2.4
                                  0.8                                                         0.4
                                                 1.7                       0.5
                                                                1.9
                             0.5                                                                0.3

                                               0.3                            0.7

                                 3
```

```
                        0.4                                                                           0.2
                                                              0.4
                                            0.2                                 0.7
                                                        0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
     BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
     BUOYANCY-INDUCED DISPERSION.                             0.4    __RELOCATE 2/3 INCH DOWN
     RURL, LONG-TERM MODE.                 0.2                0.3--/               4.6                SLOPING TERRAIN CONCEPT.
1




                                             WARNING -- RE SOURCE   2, CRUSHER (SOURCE #2)
                                              PLUME RISE FACTORS SET TO 0.0 BECAUSE
                                              EFFLUENT FACTORS ARE NOT SPECIFIED BY USER.
1                                        2.6            /--   4.2                   11.2
                                  RELOCATE 2/3 INCH UP-/      8.8

                                            4.4                              14.8

                                                             12.6
                        5.3                                                                          10.6
                                               4.7                                 13.5

                             6.6                                                                 6.8         VALLEY
  1280                                                       10.4                                      CRUSHER (SOURCE #2)
                                                 8.4                          17.2
                                  7.9                                                        24.6
                                                                                                    TSP ANNUAL AVERAGE A
                                                                 NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                       9.9                   13.5                    20.9
          5.1                                        9.6              14.0                                     5.4
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 596.17
                  11.1                                                                                   6.6
                                            13.6                                  13.5
                         17.7                                20.9                                    8.0
                                                       27.5        15.6
                                 28.9            16.5                     20.3               10.7
                                      29.3                                           22.5
                                                             57.0
                                              8.1       28.9      36.8          20.7
                                                          100.3   66.4
                                                    110.8  *********  51.9                           MULTIPLY PRINTED VALUES BY

                                 4
```

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                                                          * COORD *                                1.0E-02 TO GET CONC. IN UG/M3
    35.3    44.2    44.4    74.3    92.7   132.9   394.1  *  _._  * 68.6     27.1    16.5    11.9     9.2     7.5     6.3
                                                          * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                   596.2  ********** 84.5   6800.FT  460.00   60.00    10.M 1.0200E+00    *******
                                                          31.3   26.0
                                           191.3    511.1      22.0         12.8   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                            24.8                       0.      0.  1316.    100.  1.00********
                                    135.6                                       8.1
                               115.4           231.7                     7.9            6.4            BRIGUN P(MB)  MWT
                                                      12.5         9.1                                     0.  846.   0.0
                        43.4                                10.7                                 4.8
                                          146.6  VV MEAN WIND SPDS(MPS) VV    5.2
                 27.0              0.67000 2.46000 4.47000 6.93000 9.61000 12.52000                    20.6

         8.9                                      147.5              10.2                                        3.2
                                     45.6                   33.4                   10.3
                                                                                                AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                 283.  283.   1.0    1.0******
                                36.5                                                    6.5
                                               42.9                       9.4
                                                            47.4
                            5.5                                                               2.5

                                              5.8                        12.9
                       4.2                                                                        2.1
                                                             7.0

                                           2.6                                65.5
                                                       0 KM      1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                             6.9   __RELOCATE 2/3 INCH DOWN
    RURL, LONG-TERM MODE.               1.9                  3.2--/              22.3              SLOPING TERRAIN CONCEPT.
1



                                            WARNING -- RE SOURCE   3, STOCK PILE (SOURCE #3)
                                             PLUME RISE FACTORS SET TO 0.0 BECAUSE
                                             EFFLUENT FACTORS ARE NOT SPECIFIED BY USER.
1                                       2.6            /--   4.2                 11.1
                                 RELOCATE 2/3 INCH UP-/      8.7

                                           4.3                                14.6

                                5
```

```
                                                           12.5
                      5.3                                                                        10.5
                                             4.7                           13.4
                           6.5                                                               6.7          VALLEY
1280                                                       10.3                                     STOCK PILE (SOURCE #3)
                                               8.3                      17.1
                                7.8                                                    24.3
                                                                                                  TSP ANNUAL AVERAGE A
                                                               NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     9.8                   13.4                   20.7
        5.1                                        9.5              13.8                                        5.3
       HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 590.32
                11.0                                                                                   6.5
                                          13.4                              13.4
                       17.5                                20.7                                 8.0
                                                     27.2        15.5
                               28.6            16.3                    20.1            10.6
                                    29.0                                          22.3
                                                           56.4
                                            8.0     28.6      36.5         20.5
                                                         99.3   65.8
                                                  109.7  ********* 51.4                          MULTIPLY PRINTED VALUES BY
                                                         * COORD *                                1.0E-02 TO GET CONC. IN UG/M3
   35.0    43.8    44.0    73.6    91.8   131.6   390.2  *  _._  * 67.9    26.8    16.3    11.8     9.1     7.4     6.3
                                                         * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                  590.3  ********* 34.2    6800.FT  460.00   60.00    10.M 1.0100E+00     ******
                                                         31.0   25.8
                                          189.4    506.1      21.8         12.7   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                           24.6                       0.      0.  1316.    100.   1.00*******
                                   134.2                                           8.0
                              114.2          229.4                     7.8             6.4            BRIGUN P(MB)  MWT
                                                     12.4         9.0                                     0.  846.   0.0
                       43.0                                10.6                                 4.8
                                         145.1  VV MEAN WIND SPDS(MPS) VV    5.1
                26.7              0.67000  2.45000  4.47000  6.93000  9.61000 12.62000                20.4
        8.8                                      146.1              10.1                                        3.1
                                    45.1                   33.1                   10.2
                                                                                               AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                283.   283.    1.0    1.0******
                               17.3                                                     6.4
                                              42.5                     9.3
                                                           46.9
                           5.5                                                               2.5
                                             5.7                          12.8
                      4.2                                                                          2.0
                                                            6.9
                                          2.6                                11.4
                                                      0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
   BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
   BUOYANCY-INDUCED DISPERSION.                             6.8   __RELOCATE 2/3 INCH DOWN
                               6
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  RURL, LONG-TERM MODE.                  1.8                   3.1--/                 22.1                SLOPING TERRAIN CONCEPT.
1      TSP ANNUAL AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
   SOURCE DATA.  PLOT 119.855
       SOURCE NAME            COORDX COORDY  STK HT  EMISS RATE  FIXD DH  SOR W  SOR H  BRIGUN  BRIGE  BRIGF  AIR T  GAS T  DIAM
  1 SCRUBBER (SOURCE #1)     460.00  60.00    37. 2.0000E-02*********    0.  6800.     19.    17.    17.  283.   319.   1.0
  2 CRUSHER (SOURCE #2)      450.00  60.00    10. 1.0200E+00*********    0.  5800.      0.     0.     0.  283.   283.   1.0
  3 STOCK PILE (SOURCE #3)   460.00  60.00    10. 1.0100E+00*********    0.  6800.      0.     0.     0.  283.   283.   1.0

 THE PLUME RISES FROM THE FOLLOWING STACKS HAVE
 BEEN ENHANCED USING THE METHOD OF BRIGGS AS DESCRIBED
 ON PAGE 161 IN COOLING TOWER ENVIRONMENT (1974).  A VALUE
 OF 0.0 INDICATES THAT PLUMES WERE NOT ENHANCED.

          ENHANCED PLUME RISE(M)

      1               0.0
      2               0.0
      3               0.0
1                                0.5            /--    0.8                 2.2
                           RELOCATE 2/3 INCH UP-/      1.8

                                  0.9                                3.0

                                                       2.5
                    1.1                                                               2.1
                                     0.9                           2.7

                        1.3                                                         1.4         VALLEY
 1280                                                  2.1                                    SUM CONC DUE TO ALL SRCS
                                       1.7                       3.4
                            1.6                                               4.9
                                                                                      TSP ANNUAL AVERAGE A
                                                      NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                2.0                    2.7                   4.2
        1.0                                 1.9             2.8                                 1.1
       HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA  FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 119.85
               2.2                                                                       1.3
                                     2.7                                2.7
                     3.5                               4.2                                 1.5
                                              5.5    3.1
                            5.8         3.3              4.1              2.1
                                5.9                                  4.5
                                                      11.4
                                     1.6      5.8     7.4         4.2
                                                 20.1   13.3
                                          22.3 ********* 10.4                            MULTIPLY PRINTED VALUES BY
                                               * COORD *                                 1.0E-01 TO GET CONC. IN UG/M3
    7.1      8.9      8.9     14.9     18.6     25.7     79.2 *  _._  * 13.7     5.4    3.3     2.4     1.8     1.5     1.3
                                               * 460,60*       SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                         119.9 *********  5.9  ******FT***********************M 0.0000E+00    ******
                                                6.3   5.2
                                     38.5   101.8      4.4        2.6  BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH

                           7
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                                                            5.0                    **************   1316.    100.    1.00*******
                                    27.3                                                1.6
                                23.2           46.5                     1.6              1.3           BRIGUN P(MB)  MWT
                                                      2.5         1.8                                ********  846.   0.0
                        8.7                                 2.1                                  1.0
                                          29.3  VV MEAN WIND SPDS(MPS) VV    1.0
                  5.4               0.67000  2.45000  4.47000  6.93000  9.61000 12.52000                4.1
         1.8                                      29.5               2.0                                           0.6
                                     9.1                    6.7                     2.1
                                                                                               AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                283.**************************
                                 3.5                                                     1.3
                                               8.6                       1.9
                                                            9.4
                            1.1                                                              0.5
                                             1.2                           2.6
                       0.8                                                                           0.4
                                                            1.4
                                          0.5                                     2.3
                                                      0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                    ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                            1.4    __RELOCATE 2/3 INCH DOWN
    RURL, LONG-TERM MODE.                  0.4              0.6--/                  4.5                SLOPING TERRAIN CONCEPT.
                                           2.4        /--   8.5                   -7.3
                                RELOCATE 2/3 INCH UP-/      2.4

                                          0.0                                    -2.4
                                                            1.2
                      -7.3                                                                           2.4
                                           -19.5                                  0.0
                          -6.1                                                               8.5           VALLEY
1280                                                        3.7                                     GROUND ELEV DIFFERENCES.
                                              -6.1                        0.0
                               -7.8                                                        -8.5
                                                                                                  TSP ANNUAL AVERAGE A
                                                               NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                    -8.5                    3.7                     1.2
       -32.9                                       0.0               2.4                                          21.9
                  NORTH TOWARD TOP.  (1/10)((SOURCE HT(1))-(RECPTR HT(N))), HTS IN METERS.
               -21.9                                                                                      19.5
                                         -12.2                                   9.1
                       -14.6                                3.0                                    15.8
                                                     -3.0         9.1
                               -8.5          -21.9                      13.4                 9.8
                                   -17.1                                                1.6
                                                            0.6
                                          -46.3      -27.4     6.1           15.2
                                                         -6.1    9.1
                                                  -21.9  *********  11.0                             MULTIPLY PRINTED VALUES BY

                               8
```

```
                                                          * COORD *                    1.0E+01 TO GET GROUND ELEV DIFF IN M
    -6.1    -4.9   -13.4    -4.9   -11.0   -17.1   -13.4  *  _._  *  11.6    15.2    15.2    12.2    18.3    23.2    25.6
                                                          * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)   FIXD DH
                                                    -8.5  *********  11.0    6800.FT************************M 0.0000E+00    ******
                                                           9.1    8.5
                                           -13.4     -2.4       7.3          15.2   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                             4.9                    *******************************************
                                     -8.5
                                -4.9            -4.3                     15.2            18.3            BRIGUN P(MB)  MWT
                                                       3.7        13.4                                 ******** 846.******
                         1.2                                 9.1                                 15.8
                                           -3.7  VV MEAN WIND SPDS(MPS) VV    11.0
                  2.4            ******************************************************                 -0.6
         6.1                                       -2.4            3.7                                           25.6
                                      1.2                    2.4                     2.4
                                                                                                 AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                  283.***************************
                                 3.7                                                      3.7
                                                1.2                        3.7
                                                             1.2
                            7.3                                                                9.8
                                              6.1                          2.4
                       8.5                                                                         15.2
                                                             6.1
                                           9.1                                2.4
                                                       0 KM      1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
                                                       ]....+....]....+....]....+....]....+....]....+....]....+....]....+....]
                                                             6.1    __RELOCATE 2/3 INCH DOWN
    RURL, LONG-TERM MODE.              12.2                  9.1--/               -8.0              SLOPING TERRAIN CONCEPT.
 ===> $EOJ
0******JOB EXITED ON 21 MAY 84 11:30:21   ******
0******CPU TIME=       0MINS    4.29SECS  ******
0******CONNECT TIME=      0MINS   15SECS  ******
EOT..
```

9

```
DI TSP24
1$JOB VTSP24 1019EPCO EPCO OUT=M:VTSP24 PRI=3          17 MAY 84 16:08:34
 ===> AS 15=D:VTSP24
 ===> AS 16=L:VTSP24
 ===> *T:VALLEY
0



                     TSP 24-HOUR AVERAGE


              SPD(MPS)    2.500    0.000    0.000    0.000    0.000    0.000
 STABILITY    WIND DIR
0     A          N     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        NNE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         NE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        ENE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          E     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        ESE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         SE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        SSE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          S     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        SSW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         SW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        WSW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          W     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        WNW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         NW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        NNW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0     B          N     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        NNE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         NE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        ENE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          E     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        ESE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         SE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        SSE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          S     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        SSW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         SW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        WSW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          W     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        WNW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         NW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        NNW     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0     C          N     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        NNE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C         NE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        ENE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C          E     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        ESE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C         SE     0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
         C      SSE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C        S   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C      SSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C       SW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C      WSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C        W   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C      WNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C       NW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         C      NNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
    0    D        N   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      NNE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D       NE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      ENE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D        E   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      ESE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D       SE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      SSE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D        S   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      SSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D       SW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      WSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D        W   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      WNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D       NW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         D      NNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
    0    E        N   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      NNE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E       NE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      ENE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E        E   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      ESE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E       SE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      SSE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E        S   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      SSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E       SW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      WSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E        W   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      WNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E       NW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         E      NNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
    0    F        N   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      NNE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F       NE   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      ENE   1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F        E   1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      ESE   1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F       SE   1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      SSE   1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F        S   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      SSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F       SW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      WSW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F        W   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F      WNW   0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

B.4 Valley Model Output for 24-Hour Average TSP Simulation

```
       F        NW     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
       F       NNW     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 1                                       2.7            /--   0.0                  0.0
                                  RELOCATE 2/3 INCH UP-/      0.0
                                            7.7                                 0.0
                                                              0.0
                       15.6                                                                        0.0
                                              16.0                            0.0
                            19.6                                                               0.0          VALLEY
  1280                                                        0.0                                    SCRUBBER (SOURCE #1)
                                                32.1                       0.0
                                 23.8                                                    0.0
                                                                                                    TSP 24-HOUR AVERAGE
                                                                 ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                      30.4                    0.0                    0.0
          4.8                                        9.0               0.0                                        0.0
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 402.5
                  11.7                                                                                     0.0
                                            42.1                               0.0
                         19.6                                 0.0                                0.0
                                                       66.4         0.0
                                 33.3            49.3                     0.0             0.0
                                      33.8                                       0.0
                                                              0.0
                                              0.0     83.6       0.0          0.0
                                                          402.5    0.0
                                                    135.4  *********  0.0                          MULTIPLY PRINTED VALUES BY
                                                           * COORD *                                1.0E-03 TO GET CONC. IN UG/M
     15.2    19.2    19.7    33.7    43.7    64.9   202.1  *  _._  *  0.0     0.0     0.0     0.0     0.0     0.0     0.0
                                                           * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    212.9  *********  0.0    6800.FT  460.00   60.00    37.M 2.0000E-02    *****
                                                            0.0    0.0
                                             64.5      0.0       0.0          0.0   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                        .                                     0.0                   ******     17.  1316.    100.   5.00********
                                      44.0                                       0.0
                                 36.2            0.0                    0.0  .          0.0                BRIGUN P(MB)  MWT
                                                        0.0      0.0                                    19.  846.   0.0
                          4.8                                 0.0                                0.0
                                             0.0  VV MEAN WIND SPDS(MPS) VV    0.0
                   2.6              2.50000  0.00000  0.00000  0.00000  0.00000  0.00000                0.0
          0.3                                        0.0               0.0                                        0.0
                                       0.0                    0.0                    0.0
                                                                                                 AIR T  GAS T   DIAM  GAS V  FLO
                                                                                                  283.   319.    1.0    3.0   2.
                                  0.0                                                    0.0
                                                 0.0                       0.0
                                                              0.0
                             0.0                                                               0.0
                                               0.0                        0.0
                                 3
```

```
                       0.0                                                                         0.0
                                                             0.0
                                           0.0                                 0.0
                                                       0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
     BRIGGS STABLE CONSTANT IS 2.6.                    ]....+....]....+....]....+....]....+....]....+....]....+....]
     BUOYANCY-INDUCED DISPERSION.                            0.0   __RELOCATE 2/3 INCH DOWN
     RURL, SHRT-TERM MODE.              0.0                  0.0--/               0.0              SLOPING TERRAIN CONCEPT.
 1



                                            WARNING -- RE SOURCE   2, CRUSHER (SOURCE #2)
                                             PLUME RISE FACTORS SET TO 0.0 BECAUSE
                                             EFFLUENT FACTORS ARE NOT SPECIFIED BY USER.
 1                                      3.9            /--   0.0                  0.0
                                 RELOCATE 2/3 INCH UP-/      0.0

                                           8.2                                 0.0
                                                             0.0
                       7.4                                                                         0.0
                                              7.3                            0.0
                            9.3                                                               0.0          VALLEY
  1280                                                       0.0                                     CRUSHER (SOURCE #2)
                                               15.3                       0.0
                                11.3                                                     0.0
                                                                                                   TSP 24-HOUR AVERAGE
                                                                ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     14.4                    0.0                    0.0
          1.9                                      17.8               0.0                                        0.0
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 191.1
                  5.3                                                                                     0.0
                                           19.7                               0.0
                         9.1                                 0.0                                 0.0
                                                      54.6         0.0
                                15.7            22.2                     0.0          0.0
                                     15.6                                           0.0
                                                             0.0
                                             0.0     35.2       0.0          0.0
                                                         191.2    0.0
                                                    61.1  *********  0.0                         MULTIPLY PRINTED VALUES BY

                                4
```

```
                                                     * COORD *                                   1.0E-01 TO GET CONC. IN UG/
      7.2      9.2      9.2     16.3     20.5     29.9     94.4  *  _._  *  0.0      0.0      0.0      0.0      0.0      0.0      0.0
                                                                 * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD D
                                                    100.6  *********  0.0    6800.FT  460.00   60.00    10.M 1.0200E+00   *****
                                                            0.0    0.0
                                         30.1      0.0      0.0          0.0   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                         0.0                      0.      0.  1316.    100.   5.00*******
                                   20.8                                        0.0
                               17.4       0.0                    0.0          0.0            BRIGUN P(MB)  MWT
                                               0.0        0.0                                       0.  846.   0.0
                         7.4                              0.0                                0.0
                                         0.0  VV MEAN WIND SPDS(MPS) VV     0.0
                  4.3             2.50000  0.00000  0.00000  0.00000  0.00000  0.00000          0.0
          0.9 -                                0.0              0.0                                   0.0
                                   0.0                 0.0                   0.0
                                                                                     AIR T  GAS T   DIAM  GAS V  FL
                                                                                      283.   283.    1.0    1.0*****
                               0.0                                       0.0
                                            0.0                   0.0
                                                         0.0
                           0.0                                              0.0
                                          0.0                     0.0
                       0.0                                                      0.0
                                                         0.0
                                       0.0                           0.0
                                                   0 KM    1.250KM  2.500KM  3.750KM  5.000KM  6.250KM  7.500KM
      BRIGGS STABLE CONSTANT IS 2.6.                ]....+....]....+....]....+....]....+....]....+....]....+....]
      BUOYANCY-INDUCED DISPERSION.                        0.0  __RELOCATE 2/3 INCH DOWN
      RURL, SHRT-TERM MODE.              0.0              0.0--/                 0.0             SLOPING TERRAIN CONCEPT.
1



                                       WARNING -- RE SOURCE   3, STOCK PILE (SOURCE #3)
                                        PLUME RISE FACTORS SET TO 0.0 BECAUSE
                                        EFFLUENT FACTORS ARE NOT SPECIFIED BY USER.
1                                    3.8         /--   0.0                0.0
                              RELOCATE 2/3 INCH UP-/      0.0

                                       8.2                                0.0

                              5
```

```
                                                            0.0
                      7.3                                                                          0.0
                                             7.2                            0.0

                           9.2                                                               0.0          VALLEY
1280                                                        0.0                                     STOCK PILE (SOURCE #3)
                                              15.1                       0.0
                               11.2                                                     0.0
                                                                                                  TSP 24-HOUR AVERAGE
                                                               ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                    14.2                    0.0                    0.0
        1.9                                       17.7               0.0                                        0.0
       HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 189.30
                 5.2                                                                                   0.0
                                          19.5                               0.0
                        9.0                                 0.0                                 0.0
                                                     54.1         0.0
                               15.6            22.0                     0.0             0.0
                                    15.4                                           0.0
                                                            0.0
                                            0.0     35.9       0.0          0.0
                                                        189.3    0.0
                                                   60.5  *********  0.0                          MULTIPLY PRINTED VALUES BY
                                                         * COORD *                                1.0E-01 TO GET CONC. IN UG/M3
    7.2     9.1     9.1    16.1    20.3    29.6    93.4  *  _._  *  0.0     0.0     0.0     0.0     0.0     0.0     0.0
                                                         * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)   FIXD DH
                                                   99.6  *********  0.0    6800.FT  460.00   60.00    10.M 1.0100E+00     ******
                                                          0.0    0.0
                                           29.8      0.0       0.0          0.0   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                            0.0                       0.      0.  1316.    100.   5.00*******
                                    20.6                                           0.0
                               17.3             0.0                     0.0             0.0            BRIGUN P(MB)  MWT
                                                      0.0         0.0                                      0.  846.   0.0
                        7.4                                 0.0                                 0.0
                                           0.0 VV MEAN WIND SPDS(MPS) VV    0.0
                 4.3              2.50000  0.00000  0.00000  0.00000  0.00000  0.00000                 0.0

        0.8                                        0.0               0.0                                        0.0
                                     0.0                    0.0                    0.0
                                                                                               AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                283.   283.    1.0    1.0******
                                0.0                                                     0.0
                                               0.0                       0.0
                                                            0.0
                           0.0                                                               0.0

                                             0.0                          0.0
                      0.0                                                                          0.0
                                                            0.0

                                          0.0                                0.0
                                                      0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
   BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
   BUOYANCY-INDUCED DISPERSION.                             0.0   __RELOCATE 2/3 INCH DOWN


                               6
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```
     RURL, SHRT-TERM MODE.                0.0                0.0--/               0.0              SLOPING TERRAIN CONCEPT.
 1      TSP 24-HOUR AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
    SOURCE DATA.  PLOT 384.503
       SOURCE NAME          COORDX COORDY  STK HT  EMISS RATE  FIXD DH  SOR W  SOR H  BRIGUN  BRIGE  BRIGF  AIR T  GAS T  DIAM
   1 SCRUBBER (SOURCE #1)    460.00  60.00     37. 2.0000E-02*********    0.  6800.    19.*******    17.  283.   319.   1.0
   2 CRUSHER (SOURCE #2)     460.00  60.00     10. 1.0200E+00*********    0.  6800.     0.     0.     0.  283.   283.   1.0
   3 STOCK PILE (SOURCE #3)  460.00  60.00     10. 1.0100E+00*********    0.  6800.     0.     0.     0.  283.   283.   1.0

  THE PLUME RISES FROM THE FOLLOWING STACKS HAVE
  BEEN ENHANCED USING THE METHOD OF BRIGGS AS DESCRIBED
  ON PAGE 161 IN COOLING TOWER ENVIRONMENT (1974).  A VALUE
  OF 0.0 INDICATES THAT PLUMES WERE NOT ENHANCED.
                  .

         ENHANCED PLUME RISE(M)

      1              0.0
      2              0.0
      3              0.0
 1                                       7.7           /--   0.0                  0.0
                                  RELOCATE 2/3 INCH UP-/     0.0

                                           16.5                                 0.0

                                                              0.0
                       14.9                                                                  0.0
                                              14.7                              0.0

                            18.7                                                             0.0      VALLEY
  1280                                                        0.0                                   SUM CONC DUE TO ALL SRCS
                                                30.7                         0.0
                                 22.7                                                   0.0
                                                                                                    TSP 24-HOUR AVERAGE
                                                                 ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                      28.9                    0.0                     0.0
          3.8             .                         35.6               0.0                                        0.0
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA  FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 384.5
                  10.6                                                                                     0.0
                                            39.6                                 0.0
                         18.4                                 0.0                                   0.0
                                                      109.4        0.0
                                 31.7           44.7                     0.0            0.0
                                      31.4                                            0.0
                                                              0.0
                                              0.0     73.0       0.0            0.0
                                                          384.5    0.0
                                                    123.0  *********  0.0                             MULTIPLY PRINTED VALUES BY
                                                           * COORD *                                  1.0E-01 TO GET CONC. IN UG/M
     14.5    18.6    18.5    32.7    41.3    60.2   189.8  *  _._  *  0.0       0.0     0.0     0.0     0.0     0.0     0.0
                                                           * 460,60*             SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    202.4  *********  0.0        ******FT************************M 0.0000E+00    *****
                                                            0.0    0.0
                                             60.5      0.0       0.0            0.0    BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH

                                 7
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```
                                                             0.0                    ***************  1316.    100.   5.00*******
                                     41.8                                           0.0
                                35.1                 0.0                     0.0              0.0           BRIGUN P(MB)  MWT
                                                       0.0         0.0                                    ********  846.   0.0
                        14.8                                 0.0                             0.0
                                            0.0  VV MEAN WIND SPDS(MPS) VV    0.0
                  8.6                2.50000 0.00000 0.00000 0.00000 0.00000 0.00000                0.0

         1.7                                        0.0               0.0                                       0.0
                                      0.0                    0.0                    0.0
                                                                                                 AIR T  GAS T   DIAM  GAS V  FLO
                                                                                                 283.**************************
                                 0.0                                                        0.0
                                                0.0                       0.0
                                                             0.0
                            0.0                                                                  0.0

                                              0.0                            0.0
                       0.0                                                                           0.0
                                                             0.0

                                           0.0                                 0.0
                                                       0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                             0.0    __RELOCATE 2/3 INCH DOWN
    RURL, SHRT-TERM MODE.               0.0                  0.0--/              0.0                SLOPING TERRAIN CONCEPT.
1                                       2.4            /-- 207.3                207.3
                                 RELOCATE 2/3 INCH UP-/    207.3


                                           0.0                               207.3

                                                           207.3
                      -7.3                                                                       207.3
                                            -19.5                          207.3

                           -6.1                                                             207.3      VALLEY
 1280                      .                               207.3                                         GROUND ELEV DIFFERENCES.
                                               -6.1                     207.3
                                -7.3                                   .              207.3
                                                                                                   TSP 24-HOUR AVERAGE
                                                                ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     -8.5                  207.3                      207.3
       -32.9                                        0.0             207.3                                        207.3
                   NORTH TOWARD TOP.  (1/10)((SOURCE HT(1))-(RECPTR HT(N))), HTS IN METERS.
                -21.9                                                                                 207.3
                                          -12.2                                207.3
                       -14.6                               207.3                                   207.3
                                                      -3.0          207.3
                                -8.5           -21.9                      207.3             207.3
                                    -17.1                                             207.3
                                                           207.3
                                           -46.3    -27.4     207.3            207.3
                                                          -6.1  207.3
                                                   -21.9  *********207.3                               MULTIPLY PRINTED VALUES BY

                                8
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                                                          * COORD *                   1.0E+01 TO GET GROUND ELEV DIFF IN M
    -6.1    -4.9   -13.4    -4.9   -11.0   -17.1   -13.4  *  _._  *207.3   207.3   207.3   207.3   207.3   207.3   207.3
                                                          * 460,60*         SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    -8.5 *********207.3     6800.FT***********************M 0.0000E+00      *****
                                                         207.3  207.3
                                           -13.4    207.3     207.3        207.3   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                           207.3                   *******************************************
                                     -8.5                                         207.3
                                -4.9           207.3                   207.3           207.3            BRIGUN P(MB)  MWT
                                                     207.3       207.3                                ********  846.******
                         1.2                               207.3                               207.3
                                          207.3  VV MEAN WIND SPDS(MPS) VV  207.3
                  2.4            ******************************************************               207.3

         6.1                                      207.3             207.3                                      207.3
                                    207.3                  207.3                  207.3
                                                                                                AIR T  GAS T   DIAM  GAS V  FLO
                                                                                                 283.**************************
                               207.3                                                   207.3
                                              207.3                     207.3
                                                           207.3
                          207.3                                                             207.3

                                            207.3                    207.3
                     2Q7.3                                                                           207.3
                                                           207.3

                                         207.3                           207.3
                                                       0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
                                                       ]....+....]....+....]....+....]....+....]....+....]....+....]....+....]
                                                           207.3   __RELOCATE 2/3 INCH DOWN
    RURL, SHRT-TERM MODE.             207.3                207.3--/             207.3              SLOPING TERRAIN CONCEPT.
0******J:VTSP24       T:VALLEY CP:K  AB  4562 @  00172 : END-OF-FILE ON I/O ATTEMPT
0******JOB EXITED ON 17 MAY 84 16:09:07   ******
0******CPU TIME=      0MINS   2.50SECS   ******
0******CONNECT TIME=     0MINS   35SECS   ******
EOT..
```

9

B.5 Valley Model Output for Annual Average SO_2 Simulation

```
DI EPCO1
1$JOB EPCO1 1019EPCO EPCO OUT=M:EPCO1 PRI=3            21 MAY 84 11:29:43
 ===> AS 15=D:EPCO1
 ===> AS 16=L:EPCO1
 ===> *T:VALLEY
0



                         SO2 ANNUAL AVERAGE A


                  SPD(MPS)   0.670    2.450    4.470    6.930    9.610   12.520
 STABILITY     WIND DIR
0        A            N    0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
         A          NNE    0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
         A           NE    0.0011   0.0002   0.0000   0.0000   0.0000   0.0000
         A          ENE    0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
         A            E    0.0013   0.0003   0.0000   0.0000   0.0000   0.0000
         A          ESE    0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
         A           SE    0.0005   0.0001   0.0000   0.0000   0.0000   0.0000
         A          SSE    0.0013   0.0003   0.0000   0.0000   0.0000   0.0000
         A            S    0.0031   0.0007   0.0000   0.0000   0.0000   0.0000
         A          SSW    0.0015   0.0004   0.0000   0.0000   0.0000   0.0000
         A           SW    0.0025   0.0007   0.0000   0.0000   0.0000   0.0000
         A          WSW    0.0024   0.0005   0.0000   0.0000   0.0000   0.0000
         A            W    0.0010   0.0003   0.0000   0.0000   0.0000   0.0000
         A          WNW    0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
         A           NW    0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
         A          NNW    0.0007   0.0002   0.0000   0.0000   0.0000   0.0000
0        B            N    0.0014   0.0014   0.0003   0.0000   0.0000   0.0000
         B          NNE    0.0011   0.0012   0.0006   0.0000   0.0000   0.0000
         B           NE    0.0026   0.0018   0.0007   0.0000   0.0000   0.0000
         B          ENE    0.0031   0.0030   0.0006   0.0000   0.0000   0.0000
         B            E    0.0024   0.0021   0.0006   0.0000   0.0000   0.0000
         B          ESE    0.0019   0.0011   0.0003   0.0000   0.0000   0.0000
         B           SE    0.0017   0.0017   0.0004   0.0000   0.0000   0.0000
         B          SSE    0.0016   0.0010   0.0002   0.0000   0.0000   0.0000
         B            S    0.0043   0.0042   0.0015   0.0000   0.0000   0.0000
         B          SSW    0.0026   0.0027   0.0014   0.0000   0.0000   0.0000
         B           SW    0.0042   0.0038   0.0035   0.0000   0.0000   0.0000
         B          WSW    0.0030   0.0031   0.0028   0.0000   0.0000   0.0000
         B            W    0.0029   0.0030   0.0016   0.0000   0.0000   0.0000
         B          WNW    0.0027   0.0018   0.0014   0.0000   0.0000   0.0000
         B           NW    0.0014   0.0011   0.0004   0.0000   0.0000   0.0000
         B          NNW    0.0013   0.0010   0.0001   0.0000   0.0000   0.0000
0        C            N    0.0015   0.0018   0.0012   0.0001   0.0000   0.0000
         C          NNE    0.0009   0.0011   0.0011   0.0002   0.0000   0.0000
         C           NE    0.0017   0.0020   0.0023   0.0005   0.0000   0.0000
         C          ENE    0.0032   0.0037   0.0023   0.0003   0.0000   0.0000
         C            E    0.0028   0.0037   0.0019   0.0003   0.0000   0.0000
         C          ESE    0.0018   0.0020   0.0012   0.0000   0.0000   0.0000
         C           SE    0.0012   0.0007   0.0004   0.0000   0.0000   0.0000

                                    1
```

	C	SSE	0.0006	0.0005	0.0009	0.0001	0.0000	0.0000
	C	S	0.0018	0.0023	0.0031	0.0006	0.0000	0.0000
	C	SSW	0.0015	0.0018	0.0040	0.0007	0.0000	0.0000
	C	SW	0.0024	0.0034	0.0083	0.0017	0.0000	0.0000
	C	WSW	0.0029	0.0043	0.0084	0.0027	0.0002	0.0000
	C	W	0.0040	0.0048	0.0070	0.0019	0.0002	0.0000
	C	WNW	0.0022	0.0021	0.0031	0.0005	0.0000	0.0000
	C	NW	0.0009	0.0012	0.0016	0.0003	0.0000	0.0000
	C	NNW	0.0009	0.0007	0.0010	0.0000	0.0000	0.0000
0	D	N	0.0019	0.0044	0.0028	0.0020	0.0003	0.0000
	D	NNE	0.0013	0.0029	0.0027	0.0036	0.0004	0.0000
	D	NE	0.0023	0.0053	0.0071	0.0043	0.0004	0.0000
	D	ENE	0.0029	0.0060	0.0072	0.0016	0.0001	0.0000
	D	E	0.0027	0.0058	0.0063	0.0009	0.0001	0.0000
	D	ESE	0.0012	0.0025	0.0011	0.0005	0.0001	0.0000
	D	SE	0.0004	0.0008	0.0008	0.0001	0.0001	0.0000
	D	SSE	0.0007	0.0017	0.0012	0.0018	0.0002	0.0001
	D	S	0.0022	0.0049	0.0082	0.0092	0.0027	0.0003
	D	SSW	0.0023	0.0051	0.0094	0.0050	0.0003	0.0001
	D	SW	0.0038	0.0092	0.0190	0.0097	0.0014	0.0001
	D	WSW	0.0043	0.0087	0.0184	0.0170	0.0033	0.0003
	D	W	0.0056	0.0114	0.0141	0.0188	0.0031	0.0003
	D	WNW	0.0026	0.0059	0.0085	0.0074	0.0006	0.0002
	D	NW	0.0018	0.0036	0.0049	0.0041	0.0004	0.0001
	D	NNW	0.0016	0.0030	0.0045	0.0027	0.0003	0.0000
0	E	N	0.0000	0.0038	0.0016	0.0000	0.0000	0.0000
	E	NNE	0.0000	0.0029	0.0026	0.0000	0.0000	0.0000
	E	NE	0.0000	0.0038	0.0033	0.0000	0.0000	0.0000
	E	ENE	0.0000	0.0066	0.0042	0.0000	0.0000	0.0000
	E	E	0.0000	0.0059	0.0023	0.0000	0.0000	0.0000
	E	ESE	0.0000	0.0018	0.0002	0.0000	0.0000	0.0000
	E	SE	0.0000	0.0003	0.0001	0.0000	0.0000	0.0000
	E	SSE	0.0000	0.0007	0.0001	0.0000	0.0000	0.0000
	E	S	0.0000	0.0031	0.0010	0.0000	0.0000	0.0000
	E	SSW	0.0000	0.0029	0.0009	0.0000	0.0000	0.0000
	E	SW	0.0000	0.0042	0.0015	0.0000	0.0000	0.0000
	E	WSW	0.0000	0.0046	0.0020	0.0000	0.0000	0.0000
	E	W	0.0000	0.0078	0.0023	0.0000	0.0000	0.0000
	E	WNW	0.0000	0.0037	0.0019	0.0000	0.0000	0.0000
	E	NW	0.0000	0.0021	0.0012	0.0000	0.0000	0.0000
	E	NNW	0.0000	0.0030	0.0027	0.0000	0.0000	0.0000
0	F	N	0.0319	0.0112	0.0000	0.0000	0.0000	0.0000
	F	NNE	0.0302	0.0116	0.0000	0.0000	0.0000	0.0000
	F	NE	0.0300	0.0120	0.0000	0.0000	0.0000	0.0000
	F	ENE	0.0319	0.0136	0.0000	0.0000	0.0000	0.0000
	F	E	0.0217	0.0084	0.0000	0.0000	0.0000	0.0000
	F	ESE	0.0087	0.0031	0.0000	0.0000	0.0000	0.0000
	F	SE	0.0030	0.0009	0.0000	0.0000	0.0000	0.0000
	F	SSE	0.0023	0.0005	0.0000	0.0000	0.0000	0.0000
	F	S	0.0056	0.0017	0.0000	0.0000	0.0000	0.0000
	F	SSW	0.0055	0.0014	0.0000	0.0000	0.0000	0.0000
	F	SW	0.0078	0.0026	0.0000	0.0000	0.0000	0.0000
	F	WSW	0.0144	0.0057	0.0000	0.0000	0.0000	0.0000
	F	W	0.0205	0.0071	0.0000	0.0000	0.0000	0.0000
	F	WNW	0.0114	0.0036	0.0000	0.0000	0.0000	0.0000

```
      F        NW      0.0079 0.0027 0.0000 0.0000 0.0000 0.0000
      F        NNW     0.0139 0.0058 0.0000 0.0000 0.0000 0.0000
1                                       1.9            /--  3.9                 14.7
                                 RELOCATE 2/3 INCH UP-/     6.6

                                           3.3                              13.5

                                                            9.0
                       7.2                                                                       7.8
                                             6.2                                 9.8

                            8.9                                                              6.1          VALLEY
 1280                                                       7.9                                        DRY FLUE GAS (SOURCE #1)
                                               11.1                         11.6
                                0.6                                                        31.9
                                                                                                  SO2 ANNUAL AVERAGE A
                                                               NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     13.3                  10.6                   13.7
         7.3                                       5.5               9.2                            .           5.0
        HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA  FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 820.94
                 15.5                                                                                      6.1
                                           18.2                                 12.1
                        24.7                               16.9                                    7.3
                                                     23.1       13.6
                                40.1            22.0                   18.0            9.6
                                     41.0                                         14.2
                                                           37.6
                                             7.6     38.0       28.4         18.1
                                                        124.7   50.0
                                                  150.8  *********  39.8                              MULTIPLY PRINTED VALUES BY
                                                         * COORD *                                     1.0E-03 TO GET CONC. IN UG/M3
    49.6    61.2    62.7   102.9   130.4   167.3  537.6  *  _._  *  49.8    23.6    14.9    10.8    8.4     6.9     5.8
                                                         * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                  820.9  *********  27.9   6800.FT  460.00   60.00    24.M 1.4000E-01    ******
                                                         20.2   18.6
                                           271.7   188.6    16.5         11.7   BRIG.E  BRIG.F  DMIX    DMNI   STAR F WIDTH
                                                           18.4                    20.     20.  1316.    100.    1.00*******
                                    192.2                                         7.5
                               161.2           305.5                  7.0            6.0            BRIGUN P(MB)  MWT
                                                      7.6        8.1                                   28.  846.   0.0
                        23.1                                9.2                                    4.5
                                          178.6  VV MEAN WIND SPDS(MPS) VV    4.7
                 14.5                0.67000  2.45000  4.47000  6.93000  9.61000 12.52000          15.6

         5.7                                     105.1               5.6                                        3.0
                                     20.5                  10.9                    5.6
                                                                                               AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                283.   352.    1.0    3.0   2.4
                                 8.1                                                   3.9
                                               18.0                        4.8
                                                           20.1
                            3.9                                                              2.3

                                             3.1                         6.5

                               3
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```
                      3.2                                                                         1.9
                                                            4.0

                                          2.1                                 6.2
                                                      0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
   BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
   BUOYANCY-INDUCED DISPERSION.                             3.7   __RELOCATE 2/3 INCH DOWN
   RURL, LONG-TERM MODE.               1.7                  2.4--/              31.9              SLOPING TERRAIN CONCEPT.
                                       1.0             /--  2.0                 13.2
                                RELOCATE 2/3 INCH UP-/      3.2


                                          1.7                                 7.8

                                                            4.3
                      6.7                                                                         3.9
                                             5.6                            4.8

                           7.8                                                               3.0          VALLEY
1280                                                        3.8                                     OIL FIRED HEATER (SOURCE
                                               9.7                       5.3
                                9.8                                                    28.6
                                                                                                  SO2 ANNUAL AVERAGE A
                                                               NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                    12.4                    5.2                    6.2
        7.1                                        2.6               4.1                                        2.4
       HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 758.06
                15.1                                                                                   2.9
                                          16.8                               5.4
                       24.0                                 7.9                                 3.4
                                                      9.1         5.5
                               38.7            19.9                     7.6             4.3
                                    39.4                                           6.1
                                                           13.3
                                            5.7     31.8       8.2          7.1
                                                         85.8   13.7
                                                  134.1  ********* 11.2                          MULTIPLY PRINTED VALUES BY
                                                         * COORD *                                1.0E-03 TO GET CONC. IN UG/M3
   46.3    50.7    61.4    80.7   126.5   179.2   489.2  *  _._  * 11.1     8.5     6.1     4.8     3.9     3.3     2.9
                                                         * 460,60*        SOR ELEV  COORDX  COORDY  STK HT Q(GM/SEC)   FIXD DH
                                                  758.1  *********  8.1    6800.FT  460.00   60.00    24.M 1.4000E-01    ******
                                                          3.8    4.6
                                          263.7     47.6       4.3          5.1   BRIG.E  BRIG.F  DMIX      DMNI  STAR F WIDTH
                                                            4.2                      33.     34.  1316.    100.   1.00*******
                                   188.4                                           3.5
                              126.7          162.3                      2.7             2.9            BRIGUN P(MB)  MWT
                                                      2.9         3.0                                     86.  846.   0.0
                       10.1                                 3.4                                 2.2
                                          86.9  VV MEAN WIND SPDS(MPS) VV    2.0
                 6.5              0.67000  2.45000  4.47000  6.93000  9.61000 12.52000                 8.1

        2.7                                       45.9               2.4                                        1.5
                                     8.2                    4.0                    2.4
                                                                                               AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                283.   589.     1.0   5.0   3.9


                               4
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```
                                  3.5                                                     1.8
                                                 6.9                       2.1
                                                              7.7
                             1.9                                                               1.1
                                               1.4                           2.8
                        1.6                                                                         1.0
                                                              1.8
                                            1.0                                 2.8
                                                        0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
     BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
     BUOYANCY-INDUCED DISPERSION.                             1.7   __RELOCATE 2/3 INCH DOWN
     RURL, LONG-TERM MODE.               0.8                  1.2--/              31.7              SLOPING TERRAIN CONCEPT.
 1                                       0.8            /--   1.8                  8.1
                                  RELOCATE 2/3 INCH UP-/      2.8
                                            1.5                                 6.2
                                                              3.9
                        4.0                                                                         3.4
                                               3.4                            4.3
                             4.9                                                               2.8          VALLEY
  1280                                                        3.6                                    SCRUBBER (SOURCE #3)
                                                 6.2                       5.0
                                  5.9                                                    17.6
                                                                                                    SO2 ANNUAL AVERAGE A
                                                                 NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                       7.4                    5.1                    6.0
          4.1                                        2.4               4.4                                        2.3
         HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 473.67
                   8.7                                                                                     2.8
                                            10.1                               6.1
                         13.9                                 8.6                                 3.5
                                                        9.0         7.2
                                 22.7            12.5                     9.5             4.7
                                      23.3                                           6.7
                                                             19.5
                                              4.1     22.1    14.6          9.6
                                                           71.2   25.5
                                                     87.8  ********* 20.7                          MULTIPLY PRINTED VALUES BY
                                                           * COORD *                                1.0E-01 TO GET CONC. IN UG/M3
     27.8    33.1    35.5    55.3    74.3   107.8   311.1  *  _._  * 25.6    12.8     7.7     5.4     4.1     3.3     2.7
                                                           * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    473.7  ********* 14.8     6800.FT  460.00   60.00    37.M 7.8600E+00    ******
                                                            9.7    9.3
                                            155.9     49.0         8.4        6.3   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                              9.6                      17.     17.  1316.    100.   1.00*******
                                     109.5                                           3.9
                                 86.6           138.3                     3.8             3.0            BRIGUN P(MB)  MWT
                                                        3.9         4.4                                     19.  846.   0.0
                          9.2                                 5.0                                 2.2
                                            69.7  VV MEAN WIND SPDS(MPS) VV    2.4

                                 5
```

```
                   5.8              0.67000  2.45000  4.47000  6.93000  9.61000 12.52000                      5.9

          2.4                                      42.0                 2.7                                       1.4
                                      7.8                     4.3                    2.4
                                                                                                AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                 283.   319.    1.0    3.0   2.4
                                 3.3                                                      1.7
                                              6.5                    2.1
                                                              7.4
                            1.8                                                               1.1

                                             1.3                       2.7
                        1.5                                                                        0.9
                                                              1.8

                                          1.0                                  2.6
                                                    0 KM     1.250KM    2.500KM    3.750KM    5.000KM    6.250KM    7.500KM
     BRIGGS STABLE CONSTANT IS 2.6.                 ].....+....]....+....]....+....]....+....]....+....]....+....]
     BUOYANCY-INDUCED DISPERSION.                             1.6    __RELOCATE 2/3 INCH DOWN
     RURL, LONG-TERM MODE.                  0.8               1.1--/                18.1                SLOPING TERRAIN CONCEPT.
1        SO2 ANNUAL AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
    SOURCE DATA.  PLOT 489.461
       SOURCE NAME             COORDX COORDY  STK HT  EMISS RATE  FIXD DH  SOR W  SOR H  BRIGUN  BRIGE  BRIGF  AIR T  GAS T  DIAM
   1 DRY FLUE GAS (SOURCE #1) 460.00  60.00     24.  1.4000E-01*********     0.  6800.     28.    20.    20.  283.   352.   1.0
   2 OIL FIRED HEATER (SOURCE 460.00  60.00     24.  1.4000E-01*********     0.  6800.     86.    33.    34.  283.   589.   1.0
   3 SCRUBBER (SOURCE #3)     460.00  60.00     37.  7.8600E+00*********     0.  6800.     19.    17.    17.  283.   319.   1.0

 THE PLUME RISES FROM THE FOLLOWING STACKS HAVE
 BEEN ENHANCED USING THE METHOD OF BRIGGS AS DESCRIBED
 ON PAGE 161 IN COOLING TOWER ENVIRONMENT (1974).  A VALUE
 OF 0.0 INDICATES THAT PLUMES WERE NOT ENHANCED.

          ENHANCED PLUME RISE(M)

       1             0.0
       2             0.0
       3             0.0
1                                   0.9           /--   1.8                8.4
                              RELOCATE 2/3 INCH UP-/    2.9

                                          1.5                              6.4

                                                              4.0
                        4.1                                                                        3.6
                                             3.5                      4.4

                             5.0                                                          2.9           VALLEY
 1280                                                         3.7                                    SUM CONC DUE TO ALL SRCS
                                               6.4                      5.1
                                  6.1                                                    18.2
                                                                                                  SO2 ANNUAL AVERAGE A
                                                            NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS

                                 6
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                                      7.6                    5.2                    6.2
         4.3                                        2.4               4.5                                        2.4
        HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 248. DEG.  NORTH TOWARD TOP.  PLOT 489.46
                  9.0                                                                                   2.9
                                           10.5                               6.3
                        14.4                                 8.9                                 3.6
                                                       9.3         7.4
                                23.5            12.9                     9.7             4.9
                                     24.1                                           6.9
                                                            20.0
                                             4.2     22.8      15.0          9.9
                                                          73.3   26.1
                                                    90.7  ********* 21.2                          MULTIPLY PRINTED VALUES BY
                                                          * COORD *                                1.0E-01 TO GET CONC. IN UG/M3
    28.8    34.2    36.7    57.1    76.9   111.5   321.3  *  _._  * 26.2    13.1     7.9     5.6     4.2     3.4     2.8
                                                          * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                   489.5  ********* 15.1   ******FT***********************M 0.0000E+00     ******
                                                          10.0    9.5
                                           161.2     51.4       8.6          6.5   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                             9.8                   *************** 1316.    100.   1.00*******
                                    113.3                                           4.0
                                89.5           143.0                     3.9             3.1            BRIGUN P(MB)  MWT
                                                       4.0         4.5                                ********* 846.   0.0
                         9.5                                 8.1                                 2.3
                                           72.3  VV MEAN WIND SPDS(MPS) VV    2.5
                  6.0               0.67000  2.45000  4.47000  6.93000  9.61000 12.52000                7.1

         2.5                                       43.5              2.8                                        1.4
                                      8.1                    4.5                    2.5
                                                                                                AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                 283.*****************************
                                 3.4                                                     1.8
                                                6.8                       2.2
                                                             7.7
                            1.8                                                               1.1

                                              1.4                          2.7
                       1.5                                                                         0.9
                                                             1.8

                                           1.0                                 2.6
                                                       0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                             1.6   __RELOCATE 2/3 INCH DOWN
    RURL, LONG-TERM MODE.               0.8                  1.1--/              18.8              SLOPING TERRAIN CONCEPT.
1                                       2.4            /--   8.5                 -7.3
                                 RELOCATE 2/3 INCH UP-/      2.4

                                           0.0                                -2.4

                                                             1.2
                      -7.3                                                                         2.4
                                            -19.5                           0.0


                                7
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                           -6.1                                                               8.5          VALLEY
 1280                                                        3.7                                     GROUND ELEV DIFFERENCES.
                                               -6.1                       0.0
                                -7.3                                                    -8.5
                                                                                                   SO2 ANNUAL AVERAGE A
                                                                NALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     -8.5                    3.7                    1.2
       -32.9                                        0.0               2.4                                       21.9
                   NORTH TOWARD TOP.  (1/10)((SOURCE HT(1))-(RECPTR HT(N))), HTS IN METERS.
                -21.9                                                                                  19.5
                                          -12.2                                9.1
                       -14.6                                 3.0                               15.8
                                                      -3.0         9.1
                                -8.5           -21.9                    13.4             9.8
                                    -17.1                                       3.0
                                                             0.6
                                           -46.3    -27.4       6.1         15.2
                                                          -6.1    9.1
                                                   -21.9  ********* 11.0                          MULTIPLY PRINTED VALUES BY
                                                          * COORD *                   1.0E+01 TO GET GROUND ELEV DIFF IN M
    -6.1    -4.9   -13.4    -4.9   -11.0   -17.1   -13.4  *  _._  * 11.6    15.2    15.2    12.2    18.3    23.2    25.6
                                                          * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    -8.5  ********* 11.0    6800.FT***********************M 0.0000E+00    ******
                                                           9.1    8.5
                                           -13.4     -2.4       7.3         15.2   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                             4.9                   *******************************************
                                     -8.5                                          18.3
                                -4.9            -4.3                    15.2            18.3            BRIGUN P(MB)  MWT
                                                       3.7        13.4                                ******** 846.******
                         1.2                                 9.1                               15.8
                                           -3.7  VV MEAN WIND SPDS(MPS) VV   11.0
                  2.4            ******************************************************                -0.6

         6.1                                       -2.4               3.7                                       25.6
                                      1.2                    2.4                    2.4
                                                                                                AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                 283.**************************
                                 3.7                                                     3.7
                                                1.2                       3.7
                                                             1.2
                            7.3                                                               9.8

                                              6.1                           2.4
                       8.5                                                                        15.2
                                                             6.1

                                           9.1                             2.4
                                                       0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
                                                       ]....+....]....+....]....+....]....+....]....+....]....+....]
                                                             6.1   __RELOCATE 2/3 INCH DOWN
    RURL, LONG-TERM MODE.              12.2                  9.1--/              -8.0              SLOPING TERRAIN CONCEPT.
===> $EOJ
0******JOB EXITED ON 21 MAY 84 11:29:58   ******
0******CPU TIME=      0MINS    4.68SECS  ******
0******CONNECT TIME=     0MINS   16SECS  ******

                                8
```

B.6 Valley Model Output for 24-Hour Average SO_2 Simulation

```
DI SO224
1$JOB VSO224 1019EPCO EPCO OUT=M:VSO224 PRI=3          17 MAY 84 16:09:07
 ===> AS 15=D:VSO224
 ===> AS 16=L:VSO224
 ===> *T:VALLEY
0



                         SO2 24-HOUR AVERAGE


               SPD(MPS)   2.500    0.000    0.000    0.000    0.000    0.000
 STABILITY   WIND DIR
0     A          N      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        NNE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         NE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        ENE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          E      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        ESE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         SE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        SSE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          S      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        SSW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         SW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        WSW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A          W      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        WNW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A         NW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      A        NNW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0     B          N      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        NNE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         NE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        ENE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          E      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        ESE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         SE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        SSE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          S      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        SSW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         SW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        WSW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B          W      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        WNW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B         NW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      B        NNW      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0     C          N      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        NNE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C         NE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        ENE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C          E      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C        ESE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
      C         SE      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

                                  1
```

```
        C      SSE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C        S    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C      SSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C       SW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C      WSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C        W    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C      WNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C       NW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        C      NNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0    D        N    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      NNE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D       NE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      ENE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D        E    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      ESE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D       SE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      SSE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D        S    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      SSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D       SW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      WSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D        W    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      WNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D       NW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        D      NNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0    E        N    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      NNE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E       NE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      ENE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E        E    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      ESE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E       SE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      SSE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E        S    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      SSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E       SW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      WSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E        W    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      WNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E       NW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        E      NNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0    F        N    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      NNE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F       NE    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      ENE    1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F        E    1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      ESE    1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F       SE    1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      SSE    1.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F        S    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      SSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F       SW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      WSW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F        W    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
        F      WNW    0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
                                 (
         F        NW      0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         F        NNW     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   1                                      2.9            /--    0.0                   0.0
                                    RELOCATE 2/3 INCH UP-/      0.0

                                              7.4                                 0.0

                                                                0.0
                         10.6                                                                          0.0
                                                10.7                            0.0

                              13.3                                                             0.0          VALLEY
    1280                                                        0.0                                     DRY FLUE GAS (SOURCE #1)
                                                  21.9                       0.0
                                   16.2                                                    0.0
                                                                                                       SO2 24-HOUR AVERAGE
                                                                   ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                        20.6                    0.0                    0.0
            3.1                                       11.4               0.0                                           0.0
           HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 272.18
                     7.8                                                                                   0.0
                                              28.4                               0.0
                           13.3                                 0.0                                 0.0
                                                         68.1          0.0
                                   22.6            32.8                     0.0             0.0
                                        22.7                                           0.0
                                                                0.0
                                                0.0     54.8       0.0          0.0
                                                            272.2    0.0
                                                       89.8  *********  0.0                         MULTIPLY PRINTED VALUES BY
                                                             * COORD *                                 1.0E-02 TO GET CONC. IN UG/M3
       10.4    13.2    13.3    23.2    29.6    43.5   135.5  *   _._   *  0.0     0.0     0.0     0.0     0.0     0.0     0.0
                                                             * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                      143.3  *********  0.0    6800.FT  460.00   60.00    24.M 1.4000E-01     ******
                                                              0.0    0.0
                                               43.4      0.0       0.0          0.0   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                                0.0                   ******     20.  1316.    100.   5.00*******
                                        29.8                                           0.0
                                   24.9            0.0                      0.0             0.0            BRIGUN P(MB)  MWT
                                                          0.0         0.0                                     28.  846.   0.0
                            5.3                                 0.0                                 0.0
                                               0.0  VV MEAN WIND SPDS(MPS) VV   0.0
                     2.9              2.50000 0.00000 0.00000 0.00000 0.00000 0.00000                  0.0

            0.4                                        0.0               0.0                                       0.0
                                         0.0                    0.0                    0.0
                                                                                                   AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                    283.   362.    1.0    3.0   2.4
                                    0.0                                                     0.0
                                                   0.0                        0.0
                                                                0.0
                               0.0                                                             0.0
                                                 0.0                           0.0

                                   3
```

```
                         0.0                                                                          0.0
                                                                 0.0

                                             0.0                                  0.0
                                                         0 KM     1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                       ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                               0.0    RELOCATE 2/3 INCH DOWN
    RURL, SHRT-TERM MODE.                   0.0                0.0--/                    0.0                SLOPING TERRAIN CONCEPT.
1                                           1.7          /--   0.0                       0.0
                                   RELOCATE 2/3 INCH UP-/      0.0

                                             4.9                                  0.0

                                                                0.0
                        10.8                                                                          0.0
                                              11.1                              0.0

                             13.5                                                                0.0           VALLEY
 1280                                                           0.0                                     OIL FIRED HEATER (SOURCE
                                                22.1                          0.0
                                  16.4                                                              0.0
                                                                                                    SO2 24-HOUR AVERAGE
                                                                   ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                       20.9                     0.0                    0.0
         3.4                                           5.6              0.0                                            0.0
       HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA   FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 263.1
                     8.1                                                                                   0.0
                                             28.7                                0.0
                          13.6                                  0.0                                   0.0
                                                        39.8         0.0
                                  22.9            33.4                    0.0             0.0
                                       23.1                                          0.0
                                                                0.0
                                             0.0       55.5          0.0          0.0
                                                           263.1    0.0
                                                      88.8 *********  0.0                                MULTIPLY PRINTED VALUES BY
                                                           * COORD *                                      1.0E-02 TO GET CONC. IN UG/M
    10.6     13.1     13.6     23.0     29.8     43.8     131.8 *   _._   *  0.0      0.0      0.0      0.0      0.0      0.0      0.0
                                                           * 460,60*        SOR ELEV   COORDX   COORDY   STK HT   Q(GM/SEC)   FIXD DH
                                                      138.9 *********  0.0    6800.FT  460.00   60.00    24.M 1.4000E-01     *****
                                                             0.0     0.0
                                             43.6       0.0       0.0         0.0   BRIG.E  BRIG.F  DMIX     DMNI  STAR F WIDTH
                                                                0.0                  ******    33.  1316.    100.    5.00*******
                                       30.0                                          0.0
                                  24.6        0.0                    0.0             0.0            BRIGUN P(MB)  MWT
                                                          0.0        0.0                                   86.  846.   0.0
                          3.0                                   0.0                                   0.0
                                             0.0  VV MEAN WIND SPDS(MPS) VV    0.0
                     1.6                2.50000  0.00000  0.00000  0.00000  0.00000  0.00000               0.0

          0.2                                           0.0                0.0                                     0.0
                                        0.0                     0.0                    0.0
                                                                                               AIR T  GAS T   DIAM  GAS V  FLO
                                                                                                283.   589.    1.0    5.0   3.

                                  4
```

```
                                  0.0                                                    0.0
                                                0.0                       0.0
                                                             0.0
                             0.0                                                              0.0
                                              0.0                          0.0
                        0.0                                                                        0.0
                                                             0.0
                                           0.0                                   0.0
                                                       0 KM      1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
    BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
    BUOYANCY-INDUCED DISPERSION.                             0.0   __RELOCATE 2/3 INCH DOWN
    RURL, SHRT-TERM MODE.               0.0                  0.0--/              0.0                 SLOPING TERRAIN CONCEPT.
1                                       1.0            /--   0.0                 0.0
                                 RELOCATE 2/3 INCH UP-/      0.0
                                           3.0                                   0.0
                                                             0.0
                       6.1                                                                         0.0
                                             6.3                              0.0
                            7.7                                                               0.0            VALLEY
 1280                                                        0.0                                     SCRUBBER (SOURCE #3)
                                              12.6                        0.0
                                 9.4                                                     0.0
                                                                                                   SO2 24-HOUR AVERAGE
                                                                ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                     11.9                    0.0                    0.0
         1.9                                         3.5              0.0                                           0.0
        HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA  FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 158.18
                  4.6                                                                                     0.0
                                           16.5                                 0.0
                         7.7                                 0.0                                 0.0
                                                      26.1         0.0
                                13.1            19.4                     0.0              0.0
                                     13.3                                           0.0
                                                             0.0
                                             0.0     32.9       0.0          0.0
                                                         158.2    0.0
                                                    53.2 *********  0.0                           MULTIPLY PRINTED VALUES BY
                                                          * COORD *                                1.0E+00 TO GET CONC. IN UG/M3
     6.0       7.5       7.7      13.3      17.2      25.5      79.4  *  _._  *  0.0      0.0       0.0       0.0       0.0       0.0       0.0
                                                          * 460,60*          SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD DH
                                                    83.7  *********  0.0     6800.FT  460.00   60.00    37.M 7.8600E+00    ******
                                                           0.0    0.0
                                            25.3      0.0       0.0          0.0     BRIG.E  BRIG.F  DMIX    DMNI   STAR F WIDTH
                                                             0.0                     ******     17.  1316.    100.    5.00*******
                                     17.3                                           0.0
                                14.2            0.0                      0.0              0.0                BRIGUN P(MB)  MWT
                                                       0.0          0.0                                         19.  846.    0.0
                         1.9                                 0.0                                 0.0
                                            0.0  VV MEAN WIND SPDS(MPS) VV    0.0
                                5
```

```
                     1.0           2.50000 0.00000 0.00000 0.00000 0.00000 0.00000                       0.0

            0.1                                        0.0               0.0                                         0.0
                                         0.0                    0.0                     0.0
                                                                                                    AIR T  GAS T   DIAM  GAS V  FLO
                                                                                                     283.   319.    1.0    3.0   2.
                                    0.0                                                        0.0
                                                   0.0                        0.0
                                                                0.0
                               0.0                                                                  0.0

                                                 0.0                            0.0
                          0.0                                                                              0.0
                                                                0.0

                                              0.0                                   0.0
                                                          0 KM      1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
       BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
       BUOYANCY-INDUCED DISPERSION.                                     0.0    __RELOCATE 2/3 INCH DOWN
       RURL, SHRT-TERM MODE.                   0.0                      0.0--/                0.0                SLOPING TERRAIN CONCEPT.
 1       SO2 24-HOUR AVERAGE ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
      SOURCE DATA.  PLOT 163.541
          SOURCE NAME           COORDX COORDY  STK HT  EMISS RATE  FIXD DH  SOR W  SOR H  BRIGUN  BRIGE   BRIGF  AIR T  GAS T  DIAM
   1 DRY FLUE GAS (SOURCE #1) 460.00  60.00     24. 1.4000E-01*********     0.  6800.     28.*******    20.  283.   352.   1.0
   2 OIL FIRED HEATER (SOURCE 460.00  60.00     24. 1.4000E-01*********     0.  6800.     86.*******    33.  283.   589.   1.0
   3 SCRUBBER (SOURCE #3)     460.00  60.00     37. 7.8600E+00*********     0.  6800.     19.*******    17.  283.   319.   1.0


    THE PLUME RISES FROM THE FOLLOWING STACKS HAVE
    BEEN ENHANCED USING THE METHOD OF BRIGGS AS DESCRIBED
    ON PAGE 161 IN COOLING TOWER ENVIRONMENT (1974).  A VALUE
    OF 0.0 INDICATES THAT PLUMES WERE NOT ENHANCED.


             ENHANCED PLUME RISE(M)

         1              0.0
         2              0.0
         3              0.0
  1                                        1.1             /--  0.0                    0.0
                                    RELOCATE 2/3 INCH UP-/      0.0

                                              3.2                                 0.0

                                                                0.0
                          6.3                                                                              0.0
                                                 6.5                            0.0

                               8.0                                                                  0.0          VALLEY
     1280                                                       0.0                                          SUM CONC DUE TO ALL SRCS
                                                  13.1                       0.0
                                    9.7                                                        0.0
                                                                                                       SO2 24-HOUR AVERAGE
                                                                   ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS

                                    6
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```
                                       12.3                    0.0                    0.0
           1.9                                        3.7               0.0                                         0.0
          HLIFE= 999.99 HRS.  CONCTR CORRCTD TO STD COND VIA  FACTOR 1.137.  MAX TOWARD 338. DEG.  NORTH TOWARD TOP.  PLOT 163.
                    4.8                                                                                    0.0
                                             17.1                               0.0
                           8.0                                 0.0                                  0.0
                                                        27.2         0.0
                                  13.5            20.0                     0.0             0.0
                                       13.7                                           0.0
                                                               0.0
                                               0.0     34.0       0.0          0.0
                                                           163.5    0.0
                                                      55.0  *********  0.0                          MULTIPLY PRINTED VALUES BY
                                                            * COORD *                                 1.0E+00 TO GET CONC. IN UG/
       6.2     7.8     8.0    13.7    17.8    26.4    82.1  *  _._  *  0.0     0.0     0.0     0.0      0.0     0.0     0.0
                                                            * 460,60*        SOR ELEV  COORDX  COORDY  STK HT  Q(GM/SEC)  FIXD D
                                                      86.5  *********  0.0   ******FT***********************M 0.0000E+00    ****
                                                             0.0    0.0
                                              26.2      0.0       0.0          0.0   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                               0.0                   **************  1316.    100.   5.00*******
                                       17.9                                           0.0
                                  14.7             0.0                     0.0             0.0             BRIGUN P(MB)  MWT
                                                         0.0         0.0                                 ********  846.   0.0
                           2.0                                 0.0                                  0.0
                                              0.0  VV MEAN WIND SPDS(MPS) VV    0.0
                    1.1              2.50000 0.00000 0.00000 0.00000 0.00000 0.00000                       0.0

           0.1                                        0.0               0.0                                         0.0
                                        0.0                    0.0                    0.0
                                                                                                  AIR T  GAS T   DIAM  GAS V  FL
                                                                                                   283.*************************
                                   0.0                                                     0.0
                                                  0.0                       0.0
                                                               0.0
                              0.0                                                               0.0

                                                0.0                           0.0
                         0.0                                                                          0.0
                                                               0.0

                                             0.0                                0.0
                                                         0 KM    1.250KM  2.500KM  3.750KM  5.000KM  6.250KM  7.500KM
      BRIGGS STABLE CONSTANT IS 2.6.                     ]....+....]....+....]....+....]....+....]....+....]....+....]
      BUOYANCY-INDUCED DISPERSION.                             0.0   __RELOCATE 2/3 INCH DOWN
      RURL, SHRT-TERM MODE.               0.0                  0.0--/               0.0              SLOPING TERRAIN CONCEPT.
  1                                       2.4            /-- 207.3                207.3
                                   RELOCATE 2/3 INCH UP-/    207.3


                                             0.0                               207.3

                                                             207.3
                        -7.3                                                                       207.3
                                              -19.5                          207.3

                                  7
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```
                            -6.1                                                             207.3         VALLEY
  1280                                                    207.3                                    GROUND ELEV DIFFERENCES.
                                               -6.1                     207.3
                                 -7.3                                                   207.3
                                                                                                   SO2 24-HOUR AVERAGE
                                                                 ANALYSIS-- MT. HOPE, NEVADA PROJECT FOR EXXON MINERALS
                                      -8.5                 207.3                   207.3
        -32.9                                       0.0              207.3                                      207.3
                    NORTH TOWARD TOP.  (1/10)((SOURCE HT(1))-(RECPTR HT(N))), HTS IN METERS.
                 -21.9                                                                                 207.3
                                          -12.2                             207.3
                        -14.6                               207.3                               207.3
                                                       -3.0      207.3
                                 -8.5          -21.9                   207.3            207.3
                                     -17.1                                         207.3
                                                            207.3
                                            -46.3    -27.4    207.3        207.3
                                                          -6.1  207.3
                                                   -21.9  *********207.3                          MULTIPLY PRINTED VALUES BY
                                                          * COORD *                    1.0E+01 TO GET GROUND ELEV DIFF IN M
     -6.1    -4.9   -13.4    -4.9   -11.0   -17.1  -13.4  *  _._  *207.3   207.3   207.3   207.3   207.3   207.3
                                                          * 460,60*        SOR ELEV  COORDX  COORDY  STK HT   Q(GM/SEC)  FIXD DH
                                                     -8.5 *********207.3    6800.FT***********************M 0.0000E+00     ******
                                                         207.3  207.3
                                            -13.4    207.3    207.3        207.3   BRIG.E  BRIG.F  DMIX    DMNI  STAR F WIDTH
                                                            207.3                  *******************************************
                                      -8.5                                         207.3
                                 -4.9          207.3                   207.3       207.3            BRIGUN P(MB)  MWT
                                                     207.3        207.3                           ********  846.******
                          1.2                               207.3                               207.3
                                           207.3  VV MEAN WIND SPDS(MPS) VV  207.3
                   2.4            ******************************************************               207.3

          6.1                                     207.3              207.3                                      207.3
                                     207.3                  207.3                  207.3
                                                                                                AIR T  GAS T   DIAM  GAS V  FLOW
                                                                                                 283.***************************
                                207.3                                                   207.3
                                              207.3                207.3
                                                           207.3
                           207.3                                                             207.3

                                             207.3                  207.3
                      207.3                                                                      207.3
                                                           207.3

                                          207.3                          207.3
                                                       0 KM      1.250KM   2.500KM   3.750KM   5.000KM   6.250KM   7.500KM
                                                       ]....+....]....+....]....+....]....+....]....+....]....+....]....+....]
                                                           207.3   __RELOCATE 2/3 INCH DOWN
     RURL, SHRT-TERM MODE.            207.3                207.3--/             207.3              SLOFING TERRAIN CONCEPT.
0******J:VS0224     T:VALLEY CP:J  AB  4562 @  00172  : END-OF-FILE ON I/O ATTEMPT
0******JOB EXITED ON 17 MAY 84 16:09:46   ******
0******CPU TIME=       0MINS    2.63SECS  ******
0******CONNECT TIME=       0MINS    41SECS  ******

                                 8
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APPENDIX 3-C

MITIGATION OF IMPACTS TO AIR QUALITY

APPENDIX 3-C

MITIGATION OF IMPACTS TO AIR QUALITY

1.0 Introduction

This Appendix presents a detailed overview of the air quality regulations and mitigation measures that EXXON has addressed. The primary mitigation measure will involve EXXON's obtaining and compliance with a Prevention of Significant Deterioration Permit. The permit conditions would detail specific emission limitations and approval of best available control technology (BACT). Because the EXXON project will not emit any of the hazardous pollutants currently identified by air quality regulations, the primary concern of air quality control will entail total suspended particulates and sulfur dioxides. Based on the control technologies presently planned for use by EXXON, the air quality impacts determined by analysis and presented in the EIS and this Technical Report were not deemed to require exceptional mitigation programs beyond those associated with eventual permit conditions.

2.0 Legal Basis of Compliance

The Clean Air Act of 1970, as amended in 1977, is the federal umbrella statute that provides for the control of air pollution from stationary and mobile sources. In 1971, the nation was geographically divided into Air Quality Control Regions (AQCR's) (Section 107 of the Act). Section 109 of the Act directed EPA to develop primary and secondary National Ambient Air Quailty Standards (NAAQS), the former to protect the public health and the latter to protect public welfare. Such standards have been promulgated for sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide and lead. These standards need not take into account the cost of compliance nor whether control technology exists.

Upon promulgation of the NAAQS, air quality in the AQCR's was examined and each AQCR was classified as an attainment or non-attainemnt area on a per pollutant basis, depending on whether air quality was better or worse than the NAAQS. Attainment areas were further divided into three classes as defined by Congress in the Clean Air Act for the purpose of identifying the increment of degradation that could be allowed.

Section 110 requires that each state develop an implementation plan (SIP) that provides for bringing the entire state into compliance with NAAQS. For AQCR's with air quality better than NAAQS, the SIP must show how prevention of significant deterioration (PSD) will occur.

Additionally, Section 111 provides for the development of technology based new source performance standards (NSPS) on an industry by industry basis. Lastly, under the authority of Section 112, EPA may promulgate standards for hazardous pollutants (NESHAPS). Like NAAQS, these standards need not take into account cost of compliance or whether technology is available to meet the standard. Standards have been promulgated for abestos, beryllium, mercury and vinyl chloride (40 CFR 61).

All of these aspects of the Clean Air Act and EPA's companion implementing regulations 40 CFR 50-99, combine to affect permitting an industrial facility. 1/ EXXON's proposed Mt. Hope project is located in a Class II attainment area for all of the NAAQS constituents. It would also be a major source [Section 169(1)] and consequently would be required to acquire a PSD permit. However, it would emit none of the hazardous pollutants currently identified under NESHAPS.

As the above demonstrates, derivation of the emission limits that would ultimately appear in EXXON's Mt. Hope project PSD permit is complex and the limits cannot be accurately predicted. Consequently, control technology that would be installed by EXXON to achieve these limits cannot be finally identified. However, mitigating measures can be discussed in terms of legally allowable increments of degradation, technology identified by HSPS, and technology in use by other members of the industry.

Section 163 of the Act establishes allowable increments for the Class I, II and III areas. The Class II allowable increase is shown below:

Pollutant	Allowable Increase Microgram/Cubic Meter
Particulate matter	19
Annual geometric mean 24-hr maximum	37
Sulfur dioxide	
Annual arithmetic mean	20
24-hr maximum	91
3-hr maximum	512

Depending on the established baseline in the area ["the ambient concentration levels which exist at the time of the first application for a permit in an area subject to this (Section 169(4)], air quality monitoring data collected and air quality modeling performed by EXXON relative to preparing the permit application, and projected emissions from other sources, EXXON would be awarded an increment of the increment.

EXXON would also be required to achieve applicable new source performance standards. On August 24, 1982 (48 FR 36859), EPA proposed a particulate matter stack emission NSPS for Metallic Mineral Processing Plants, including molybdenum, of 0.05 gms per dry standard cubic meter.

3.0 Process Plant Emissions

Control technology commonly used by the industry is discussed below, as provided by the EXXON EIS team.

1/ PSD permitting is carried out by EPA as per 40 CFR 124 until a state has an approved SIP which by fiat includes delegation of permitting authority. Nevada does not yet have an approved SIP. When such approval is granted, state permitting procedures as in NRS 445 will apply.

Particulate Emissions. Dust collection would be provided over the primary ore crusher, at conveyor feed points, on the multi-hearth roasters of the TMO plant and on the mold box (firing area) of the FeMo plant. Dust-laden air from primary ore crushing and at concentrator conveyor feed points would be water-scrubbed to remove particulates. Wet-grinding would also be effective in particulate removel. If promulgated, this segment of the plant would have to achieve the NSPS cited above.

Dust-laden air from the TMO plant pneumatic conveyor system would pass through a reverse jet bag filter. Emissions from the multi-hearth roasters of the TMO plant would be passed through multi-cyclones to control particulates.

SO_2 Emissions. SO_2 would be contained primarily in the roaster flue gas generated during TMO production. This gas would be combined with the bag filter exhaust and passed through the multi-cyclones (mentioned above). It would then go through an electrostatic precipitator to remove submicron particles, followed by a scrubber using $Ca(OH)_2$ slurry to remove SO_2 prior to discharge to the atmosphere. The resultant waste stream would contain $CaSO_3$ and $CaSO_4$. Emissions from the mold box (firing area) of the FeMo plant would be passed through a cyclone and a baghouse in series.

Also, vents from various material enclosures (e.g., dry concentrate storage bin, roaster feed bin, lime bin, TMO bin, sand bin, etc.) would be equipped with passive filters to remove particulates from air vented to the atmosphere. These filters would typically be cartridge, manually-replaceable types.

Chlorine Emissions. Air vented from the chlorine storage tanks, leach autoclaves and cooling vessel associated with the hydrometallurgical plant would be collected and passed through a scrubbing tower using a sodium hydroxide solution for chlorine fume removal prior to discharge to atmosphere. A dilute sodium hypochlorite solution would be generated and routed to the wastewater treatment plant.

4.0 Fugitive Emissions

Fugitive dust, not controlled by permitting, would required mitigation and has been proposed by EXXON. It would be standard practice to wet down disturbed land surfaces during construction activities. This practice would hold true also for roads in routine use during construction and operation phases of the project. Fugitive emissions from the surface of the tailings pond would be minimized by the deposition design planned to date. Material prone to dusting would be separated with cyclone classifiers and confined within a small area of the tailings pond. The surface area susceptible to aeolian (wind) erosion would be much smaller than if distributed throughout the pond and segregated by natural sedimentation. This smaller area would be

sprayed with cyclone overflow and would cake upon drying, thereby reducing the potential for erosion.

Air Monitoring Program

The duration of the collection period would be defined by the permitting authority. Air quality/meteorological data would be collected in conjunction with PSD permitting. The actual monitoring scheme would be jointly worked out with Region IX (San Francisco, California) of the EPA, the Nevada State Department of Environmental Protection and EXXON and would depend on the status of the SIP at the time. Based on existing regulatory framework and imminent modifications, monitoring for the parameters shown in Table C-1 would occur. Monitoring would take place at two stations at the Mt. Hope site.

Monitoring would be required to be conducted during operation as a condition of the Mt. Hope project's PSD permit. The parameters to be measured and frequency of analysis would depend upon the stipulations of the permit.

Table C-1 Parameters to be Analyzed for During Pre-Construciton Air Quality/ Meteorological Monitoring Program

Station #	Parameter
1/	No_x
	SO_2
	TSP (collocated with fine particle capture) 1/
	Visibility
	Trace Metals/Elements 2/
	Temperature
	Barometric Pressure
	Relative Humidity
	Precipitation
	Evaporation
	Wind Direction
	Wind Speed
2/	TSP 1/

1/ In accordance with State of Nevada monitoring network practices, particulate filters woauld be collected every six (6) days.

2/ Every other particulate filter would be analyzed for the trace metals/elements of cadmium, copper, lead, mercury, nitrate and sulfate for the first three months of the monitoring period. At the end of this period a determination will be made to continue or terminate these analyses.

Source: EXXON Minerals Company

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Form 1279—3
(June 1984)

BORROWER'

TD 195 .M5 M68

Meteorology an
: Mt. Hope mo

DATE LOANED	BORROWER
12/1/87	Charles gaskill Casper D.O
DEC 17 '87	Greg Eschaechner Nevada S.O.
JAN 5 '87	Scott Archer 776- Colo. S.O.

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